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# LED TV

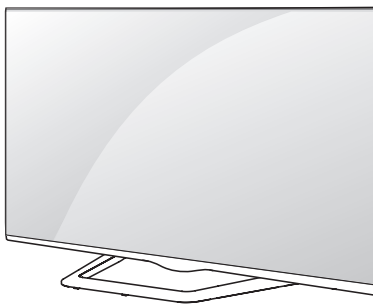
# SERVICE MANUAL

CHASSIS : LD34D

**MODEL: 60LA860V/W/9 60LA860V/W/9-ZA**

## CAUTION

BEFORE SERVICING THE CHASSIS,  
READ THE SAFETY PRECAUTIONS IN THIS MANUAL.



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# SAFETY PRECAUTIONS

## IMPORTANT SAFETY NOTICE

Many electrical and mechanical parts in this chassis have special safety-related characteristics. These parts are identified by  $\triangle$  in the Schematic Diagram and Exploded View.

It is essential that these special safety parts should be replaced with the same components as recommended in this manual to prevent Shock, Fire, or other Hazards.

Do not modify the original design without permission of manufacturer.

### General Guidance

An **isolation Transformer should always be used** during the servicing of a receiver whose chassis is not isolated from the AC power line. Use a transformer of adequate power rating as this protects the technician from accidents resulting in personal injury from electrical shocks.

It will also protect the receiver and its components from being damaged by accidental shorts of the circuitry that may be inadvertently introduced during the service operation.

If any fuse (or Fusible Resistor) in this TV receiver is blown, replace it with the specified.

When replacing a high wattage resistor (Oxide Metal Film Resistor, over 1 W), keep the resistor 10 mm away from PCB.

Keep wires away from high voltage or high temperature parts.

### Before returning the receiver to the customer,

always perform an **AC leakage current check** on the exposed metallic parts of the cabinet, such as antennas, terminals, etc., to be sure the set is safe to operate without damage of electrical shock.

### Leakage Current Cold Check(Antenna Cold Check)

With the instrument AC plug removed from AC source, connect an electrical jumper across the two AC plug prongs. Place the AC switch in the on position, connect one lead of ohm-meter to the AC plug prongs tied together and touch other ohm-meter lead in turn to each exposed metallic parts such as antenna terminals, phone jacks, etc.

If the exposed metallic part has a return path to the chassis, the measured resistance should be between 1 M $\Omega$  and 5.2 M $\Omega$ .

When the exposed metal has no return path to the chassis the reading must be infinite.

An other abnormality exists that must be corrected before the receiver is returned to the customer.

### Leakage Current Hot Check (See below Figure)

Plug the AC cord directly into the AC outlet.

### Do not use a line Isolation Transformer during this check.

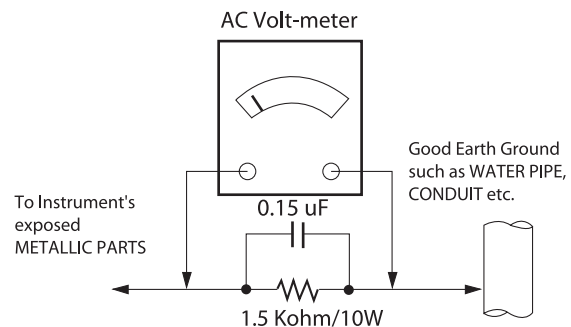
Connect 1.5 K / 10 watt resistor in parallel with a 0.15  $\mu$ F capacitor between a known good earth ground (Water Pipe, Conduit, etc.) and the exposed metallic parts.

Measure the AC voltage across the resistor using AC voltmeter with 1000 ohms/volt or more sensitivity.

Reverse plug the AC cord into the AC outlet and repeat AC voltage measurements for each exposed metallic part. Any voltage measured must not exceed 0.75 volt RMS which corresponds to 0.5 mA.

In case any measurement is out of the limits specified, there is possibility of shock hazard and the set must be checked and repaired before it is returned to the customer.

### Leakage Current Hot Check circuit



When 25A is impressed between Earth and 2nd Ground for 1 second, Resistance must be less than 0.1  $\Omega$

\*Base on Adjustment standard

# SERVICING PRECAUTIONS

**CAUTION:** Before servicing receivers covered by this service manual and its supplements and addenda, read and follow the **SAFETY PRECAUTIONS** on page 3 of this publication.  
**NOTE:** If unforeseen circumstances create conflict between the following servicing precautions and any of the safety precautions on page 3 of this publication, always follow the safety precautions. Remember: Safety First.

## General Servicing Precautions

1. Always unplug the receiver AC power cord from the AC power source before;
  - a. Removing or reinstalling any component, circuit board module or any other receiver assembly.
  - b. Disconnecting or reconnecting any receiver electrical plug or other electrical connection.
  - c. Connecting a test substitute in parallel with an electrolytic capacitor in the receiver.**CAUTION:** A wrong part substitution or incorrect polarity installation of electrolytic capacitors may result in an explosion hazard.
2. Test high voltage only by measuring it with an appropriate high voltage meter or other voltage measuring device (DVM, FETVOM, etc) equipped with a suitable high voltage probe. Do not test high voltage by "drawing an arc".
3. Do not spray chemicals on or near this receiver or any of its assemblies.
4. Unless specified otherwise in this service manual, clean electrical contacts only by applying the following mixture to the contacts with a pipe cleaner, cotton-tipped stick or comparable non-abrasive applicator; 10 % (by volume) Acetone and 90 % (by volume) isopropyl alcohol (90 % - 99 % strength)  
**CAUTION:** This is a flammable mixture.  
Unless specified otherwise in this service manual, lubrication of contacts is not required.
5. Do not defeat any plug/socket B+ voltage interlocks with which receivers covered by this service manual might be equipped.
6. Do not apply AC power to this instrument and/or any of its electrical assemblies unless all solid-state device heat sinks are correctly installed.
7. Always connect the test receiver ground lead to the receiver chassis ground before connecting the test receiver positive lead.  
Always remove the test receiver ground lead last.
8. Use with this receiver only the test fixtures specified in this service manual.  
**CAUTION:** Do not connect the test fixture ground strap to any heat sink in this receiver.

## Electrostatically Sensitive (ES) Devices

Some semiconductor (solid-state) devices can be damaged easily by static electricity. Such components commonly are called Electrostatically Sensitive (ES) Devices. Examples of typical ES devices are integrated circuits and some field-effect transistors and semiconductor "chip" components. The following techniques should be used to help reduce the incidence of component damage caused by static by static electricity.

1. Immediately before handling any semiconductor component or semiconductor-equipped assembly, drain off any electrostatic charge on your body by touching a known earth ground. Alternatively, obtain and wear a commercially available discharging wrist strap device, which should be removed to prevent potential shock reasons prior to applying power to the unit under test.

2. After removing an electrical assembly equipped with ES devices, place the assembly on a conductive surface such as aluminum foil, to prevent electrostatic charge buildup or exposure of the assembly.
3. Use only a grounded-tip soldering iron to solder or unsolder ES devices.
4. Use only an anti-static type solder removal device. Some solder removal devices not classified as "anti-static" can generate electrical charges sufficient to damage ES devices.
5. Do not use freon-propelled chemicals. These can generate electrical charges sufficient to damage ES devices.
6. Do not remove a replacement ES device from its protective package until immediately before you are ready to install it. (Most replacement ES devices are packaged with leads electrically shorted together by conductive foam, aluminum foil or comparable conductive material).
7. Immediately before removing the protective material from the leads of a replacement ES device, touch the protective material to the chassis or circuit assembly into which the device will be installed.  
**CAUTION:** Be sure no power is applied to the chassis or circuit, and observe all other safety precautions.
8. Minimize bodily motions when handling unpackaged replacement ES devices. (Otherwise harmless motion such as the brushing together of your clothes fabric or the lifting of your foot from a carpeted floor can generate static electricity sufficient to damage an ES device.)

## General Soldering Guidelines

1. Use a grounded-tip, low-wattage soldering iron and appropriate tip size and shape that will maintain tip temperature within the range of 500 °F to 600 °F.
2. Use an appropriate gauge of RMA resin-core solder composed of 60 parts tin/40 parts lead.
3. Keep the soldering iron tip clean and well tinned.
4. Thoroughly clean the surfaces to be soldered. Use a mall wire-bristle (0.5 inch, or 1.25 cm) brush with a metal handle. Do not use freon-propelled spray-on cleaners.
5. Use the following unsoldering technique
  - a. Allow the soldering iron tip to reach normal temperature. (500 °F to 600 °F)
  - b. Heat the component lead until the solder melts.
  - c. Quickly draw the melted solder with an anti-static, suction-type solder removal device or with solder braid.  
**CAUTION:** Work quickly to avoid overheating the circuit board printed foil.
6. Use the following soldering technique.
  - a. Allow the soldering iron tip to reach a normal temperature (500 °F to 600 °F)
  - b. First, hold the soldering iron tip and solder the strand against the component lead until the solder melts.
  - c. Quickly move the soldering iron tip to the junction of the component lead and the printed circuit foil, and hold it there only until the solder flows onto and around both the component lead and the foil.  
**CAUTION:** Work quickly to avoid overheating the circuit board printed foil.
  - d. Closely inspect the solder area and remove any excess or splashed solder with a small wire-bristle brush.



### IC Remove/Replacement

Some chassis circuit boards have slotted holes (oblong) through which the IC leads are inserted and then bent flat against the circuit foil. When holes are the slotted type, the following technique should be used to remove and replace the IC. When working with boards using the familiar round hole, use the standard technique as outlined in paragraphs 5 and 6 above.

#### Removal

1. Desolder and straighten each IC lead in one operation by gently prying up on the lead with the soldering iron tip as the solder melts.
2. Draw away the melted solder with an anti-static suction-type solder removal device (or with solder braid) before removing the IC.

#### Replacement

1. Carefully insert the replacement IC in the circuit board.
2. Carefully bend each IC lead against the circuit foil pad and solder it.
3. Clean the soldered areas with a small wire-bristle brush. (It is not necessary to reapply acrylic coating to the areas).

### "Small-Signal" Discrete Transistor

#### Removal/Replacement

1. Remove the defective transistor by clipping its leads as close as possible to the component body.
2. Bend into a "U" shape the end of each of three leads remaining on the circuit board.
3. Bend into a "U" shape the replacement transistor leads.
4. Connect the replacement transistor leads to the corresponding leads extending from the circuit board and crimp the "U" with long nose pliers to insure metal to metal contact then solder each connection.

### Power Output, Transistor Device

#### Removal/Replacement

1. Heat and remove all solder from around the transistor leads.
2. Remove the heat sink mounting screw (if so equipped).
3. Carefully remove the transistor from the heat sink of the circuit board.
4. Insert new transistor in the circuit board.
5. Solder each transistor lead, and clip off excess lead.
6. Replace heat sink.

### Diode Removal/Replacement

1. Remove defective diode by clipping its leads as close as possible to diode body.
2. Bend the two remaining leads perpendicular y to the circuit board.
3. Observing diode polarity, wrap each lead of the new diode around the corresponding lead on the circuit board.
4. Securely crimp each connection and solder it.
5. Inspect (on the circuit board copper side) the solder joints of the two "original" leads. If they are not shiny, reheat them and if necessary, apply additional solder.

### Fuse and Conventional Resistor

#### Removal/Replacement

1. Clip each fuse or resistor lead at top of the circuit board hollow stake.
2. Securely crimp the leads of replacement component around notch at stake top.

3. Solder the connections.

**CAUTION:** Maintain original spacing between the replaced component and adjacent components and the circuit board to prevent excessive component temperatures.

### Circuit Board Foil Repair

Excessive heat applied to the copper foil of any printed circuit board will weaken the adhesive that bonds the foil to the circuit board causing the foil to separate from or "lift-off" the board. The following guidelines and procedures should be followed whenever this condition is encountered.

#### At IC Connections

To repair a defective copper pattern at IC connections use the following procedure to install a jumper wire on the copper pattern side of the circuit board. (Use this technique only on IC connections).

1. Carefully remove the damaged copper pattern with a sharp knife. (Remove only as much copper as absolutely necessary).
2. Carefully scratch away the solder resist and acrylic coating (if used) from the end of the remaining copper pattern.
3. Bend a small "U" in one end of a small gauge jumper wire and carefully crimp it around the IC pin. Solder the IC connection.
4. Route the jumper wire along the path of the out-away copper pattern and let it overlap the previously scraped end of the good copper pattern. Solder the overlapped area and clip off any excess jumper wire.

#### At Other Connections

Use the following technique to repair the defective copper pattern at connections other than IC Pins. This technique involves the installation of a jumper wire on the component side of the circuit board.

1. Remove the defective copper pattern with a sharp knife. Remove at least 1/4 inch of copper, to ensure that a hazardous condition will not exist if the jumper wire opens.
2. Trace along the copper pattern from both sides of the pattern break and locate the nearest component that is directly connected to the affected copper pattern.
3. Connect insulated 20-gauge jumper wire from the lead of the nearest component on one side of the pattern break to the lead of the nearest component on the other side.

Carefully crimp and solder the connections.

**CAUTION:** Be sure the insulated jumper wire is dressed so the it does not touch components or sharp edges.

# SPECIFICATION

NOTE : Specifications and others are subject to change without notice for improvement.

## 1. Application range

This specification is applied to the LED TV used LD34D chassis.

## 2. Requirement for Test

Each part is tested as below without special appointment.

- 1) Temperature: 25 °C ± 5 °C(77 °F ± 9 °F), CST: 40 °C ± 5 °C
- 2) Relative Humidity: 65 % ± 10 %
- 3) Power Voltage
  - : Standard input voltage (AC 100-240 V~, 50/60 Hz)
  - \* Standard Voltage of each products is marked by models.
- 4) Specification and performance of each parts are followed each drawing and specification by part number in accordance with BOM.
- 5) The receiver must be operated for about 20 minutes prior to the adjustment.

## 3. Test method

- 1) Performance: LGE TV test method followed
- 2) Demanded other specification
  - Safety : CE, IEC specification
  - EMC : CE, IEC
  - Wireless : Wireless HD Specification (Option)

## 4. Model General Specification

No.	Item	Specification	Remarks
1	Market	EU(PAL Market-36Countries)/CIS + Morocco(Africa)	<p><b>DTV &amp; Analog (Total 37 countries)</b></p> <p><b>DTV (MPEG2/4, DVB-T) : 30 countries</b> Germany, Netherland, Switzerland, Hungary, Austria, Slovenia, Bulgaria, France, Spain, Italy, Belgium, Russia, Luxemburg, Greece, Czech, Croatia, Turkey, Moroco, Ireland, Latvia, Estonia, Lithuania, Poland, Portugal, Romania, Albania, Bosnia, Serbia, Slovakia, Beralus</p> <p><b>DTV (MPEG2/4, DVB-T2) : 8 countries</b> UK(Ireland), Sweden, Denmark, Finland, Norway, Ukraine, Kazakhstan, Russia</p> <p><b>DTV (MPEG2/4, DVB-C) : 37 countries</b> Germany, Netherland, Switzerland, Hungary, Austria, Slovenia, Bulgaria, France, Spain, Italy, Belgium, Russia, Luxemburg, Greece, Czech, Croatia, Turkey, Moroco, Ireland, Latvia, Estonia, Lithuania, Poland, Portugal, Romania, Albania, Bosnia, Serbia, Slovakia, Beralus, UK, Sweden, Denmark, Finland, Norway, Ukraine, Kazakhstan</p> <p><b>DTV (MPEG2/4, DVB-S/S2) : 30 countries</b> Germany, Netherland, Switzerland, Hungary, Austria, Slovenia, Bulgaria, France, Spain, Italy, Belgium, Russia, Luxemburg, Greece, Czech, Croatia, Turkey, Moroco, Ireland, Latvia, Estonia, Lithuania, Poland, Portugal, Romania, Albania, Bosnia, Serbia, Slovakia, Beralus, UK, Sweden, Denmark, Finland, Norway, Ukraine, Kazakhstan</p> <p><b>Supported satellite : 29 satellites</b> ABS1 75.0E/ AMOS 4.0W/ ASIATSATS 105.5E/ ASTRA1LHMKR 19.2E/ ASTRA2ABD 28.2E/ ASTRA3AB 23.5E/ ASTRA4A 4.8E/ ATLANTICBIRD2 8.0W/ ATLANTICBIRD3 5.0W/ BADR 26.0E/ EURO-BIRD3 33.0E/ EURO-BIRD9A 9.0E/ EUTELSATW2A 10.E/ EUTELSATW3A 7.0E/ EUTELSATW4W7 36.0E/ EUTELSESAT 16.0E/ EXPRESSAM1 40.0E/ EXPRESAM3 140.0E/ EXPRESSAM33 96.5E/ HELLASAT2 39.0E/ HISPASAT1CDE 30.0W/ HOTBIRD 13.0E/ INTELSAT10&amp;7 68.5E/ INTELSAT15 85.2E/ INTELSAT904 60.0E/ NILESAT 7.0W/ THOR 0.8W/ TURKSAT 42.0E/ YAMAL201 90.0E</p>

No.	Item	Specification	Remarks
2	Broadcasting system	1) PAL-BG/DK/I/I' 2) SECAM L/L', DK, BG, I 3) DVB-T/T2, C, S/S2	
3	Program coverage	1 ) Digital TV - VHF, UHF - C-Band, Ku-Band 2) Analogue TV -VHF : E2 to E12 -UHF : E21 to E69 -CATV : S1 to S20 -HYPER : S21 to S47	
4	Receiving system	Analog : Upper Heterodyne Digital : COFDM, QAM	<p>► DVB-T</p> <ul style="list-style-type: none"> <li>- Guard Interval(Bitrate_Mbit/s) 1/4, 1/8, 1/16, 1/32</li> <li>- Modulation : Code Rate QPSK : 1/2, 2/3, 3/4, 5/6, 7/8 16-QAM : 1/2, 2/3, 3/4, 5/6, 7/8 64-QAM : 1/2, 2/3, 3/4, 5/6, 7/8</li> </ul> <p>► DVB-T2</p> <ul style="list-style-type: none"> <li>- Guard Interval(Bitrate_Mbit/s) 1/4, 1/8, 1/16, 1/32, 1/128, 19/128, 19/256,</li> <li>- Modulation : Code Rate QPSK : 1/2, 2/5, 2/3, 3/4, 5/6 16-QAM : 1/2, 2/5, 2/3, 3/4, 5/6 64-QAM : 1/2, 2/5, 2/3, 3/4, 5/6 256-QAM : 1/2, 2/5, 2/3, 3/4, 5/6</li> </ul> <p>► DVB-C</p> <ul style="list-style-type: none"> <li>- Symbolrate : 4.0Msymbols/s to 7.2 Msymbols/s</li> <li>- Modulation : 16QAM, 64-QAM, 128-QAM and 256-QAM</li> </ul> <p>► DVB-S/S2</p> <ul style="list-style-type: none"> <li>- symbolrate : DVB-S2 (8PSK / QPSK) : 2 ~ 45 Msymbol/s DVB-S (QPSK) : 2 ~ 45 Msymbol/s</li> <li>- viterbi DVB-S mode : 1/2, 2/3, 3/4, 5/6, 7/8 DVB-S2 mode : 1/2, 2/3, 3/4, 3/5, 4/5, 5/6, 8/9, 9/10</li> </ul>
5	Input Voltage	AC 100 ~ 240 V, 50/60 Hz	

## 5. External input format

### 5.1. 2D Mode

(1) Component input(Y, CB/PB, CR/PR)

No.	Resolution	H-freq(kHz)	V-freq(Hz)	
1.	720×480	15.73	60.00	SDTV, DVD 480i
2.	720×480	15.63	59.94	SDTV, DVD 480i
3.	720×480	31.47	59.94	480p
4.	720×480	31.50	60.00	480p
5.	720×576	15.625	50.00	SDTV 576i
6.	720×576	31.25	50.00	SDTV 576p
7.	1280×720	45.00	50.00	HDTV 720p
8.	1280×720	44.96	59.94	HDTV 720p
9.	1280×720	45.00	60.00	HDTV 720p
10.	1920×1080	31.25	50.00	HDTV 1080i
11.	1920×1080	33.75	60.00	HDTV 1080i
12.	1920×1080	33.72	59.94	HDTV 1080i
13.	1920×1080	56.250	50	HDTV 1080p
14.	1920×1080	67.5	60	HDTV 1080p

(2) HDMI Input (PC/DTV)

No.	Resolution	H-freq(kHz)	V-freq.(Hz)	Pixel clock(MHz)	VIC	Proposed	
<b>HDMI-PC</b>							DDC
1	640*350	31.468	70.09	25.17		EGA	X
2	720*400	31.469	70.08	28.32		DOS	O
3	640*480	31.469	59.94	25.17		VESA(VGA)	O
4	800*600	37.879	60.31	40.00		VESA(SVGA)	O
5	1024*768	48.363	60.00	65.00		VESA(XGA)	O
6	1152*864	54.348	60.053	80		VESA	
7	1280*1024	63.981	60.020	108		VESA(SXGA)	O
8	1360*768	47.712	60.015	85.5		VESA(WXGA)	O
9	1920*1080	67.5	60.00	148.5		WUXGA(CEA861D)	O
<b>HDMI-DTV</b>							
1	640*480	31.469 / 31.5	59.94/ 60	25.125	1	SDTV 480P	
2	720*480	31.469 / 31.5	59.94 / 60	27.00/27.03	2,3	SDTV 480P	
3	720*576	31.25	50	27	17,18	SDTV 576P	
4	720*576	15.625	50	27	21	SDTV 576I	
5	1280*720	37.500	50	74.25	19	HDTV 720P	
6	1280*720	44.96 / 45	59.94 / 60	74.17/74.25	4	HDTV 720P	
7	1920*1080	33.72 / 33.75	59.94 / 60	74.17/74.25	5	HDTV 1080I	
8	1920*1080	28.125	50.00	74.25	20	HDTV 1080I	
9	1920*1080	26.97 / 27	23.97 / 24	74.17/74.25	32	HDTV 1080P	
10	1920*1080		25		33	HDTV 1080P	
11	1920*1080	33.716 / 33.75	29.976 / 30.00	74.25	34	HDTV 1080P	
12	1920*1080	56.250	50	148.5	31	HDTV 1080P	
13	1920*1080	67.43 / 67.5	59.94 / 60	148.35/148.50	16	HDTV 1080P	

## 5.2. 3D Mode

(1) RF Input(3D supported mode manually)

No.	Resolution	Proposed	3D input proposed mode
1	HD - DTV	1080I 720P	2D to 3D Side by Side(Half) Top & Bottom
2	SD - DTV	576P 576I	
3	SD - ATV(CVBS/SCART)		

(2) RF Input(3D supported mode automatically)

No.	Signal	3D input proposed mode
1	Frame Compatible	Side by Side(Half), Top & Bottom

(3) HDMI 1.3 (3D supported mode manually)

No	Resolution	H-freq(kHz)	V-freq.(Hz)	Pixel clock(MHz)	Proposed	3D input proposed mode
1	720*480	31.5	60	27.03	SDTV 480P	2D to 3D, Side by Side(Half), Top & Bottom, Checker Board, Frame Sequential, Row Interleaving, Column Interleaving
2	720*576	31.25	50	27	SDTV 576P	
3	1280*720	45.00	60.00	74.25	HDTV 720P	
4	1280*720	37.500	50	74.25	HDTV 720P	2D to 3D, Side by Side(Half), Top & Bottom
5	1920*1080	33.75	60.00	74.25	HDTV 1080I	
6	1920*1080	28.125	50.00	74.25	HDTV 1080I	
7	1920*1080	27.00	24.00	74.25	HDTV 1080P	2D to 3D, Side by Side(Half), Top & Bottom, Checker Board, Row Interleaving, Column Interleaving
8	1920*1080	28.12	25	74.25	HDTV 1080P	
9	1920*1080	33.75	30.00	74.25	HDTV 1080P	
10	1920*1080	67.50	60.00	148.5	HDTV 1080P	2D to 3D, Side by Side(Half), Top & Bottom, Checker Board, Single Frame Sequential, Row Interleaving, Column Interleaving
11	1920*1080	56.250	50	148.5	HDTV 1080P	

## (4) HDMI 1.4b (3D supported mode automatically)

No.	Resolution	H-freq(kHz)	V-freq.(Hz)	Pixel clock(MHz)	VIC	3D input proposed mode	Proposed
1	640*480	31.469 / 31.5	59.94/ 60	25.125/25.2	1	Top-and-Bottom Side-by-side(half)	Secondary(SDTV 480P) Secondary(SDTV 480P)
2		62.938/63	59.94/ 60	50.35/50.4	1	Frame packing Line alternative	Secondary(SDTV 480P) (SDTV 480P)
3		31.469 / 31.5	59.94/ 60	50.35/50.4	1	Side-by-side(Full)	(SDTV 480P)
4	720*480	31.469 / 31.5	59.94 / 60	27.00/27.03	2,3	Top-and-Bottom Side-by-side(half)	Secondary(SDTV 480P) Secondary(SDTV 480P)
5		62.938/63	59.94 / 60	54/54.06	2,3	Frame packing Line alternative	Secondary(SDTV 480P) (SDTV 480P)
6		31.469 / 31.5	59.94 / 60	54/54.06	2,3	Side-by-side(Full)	(SDTV 480P)
7	720*576	31.25	50	27	17,18	Top-and-Bottom Side-by-side(half)	Secondary(SDTV 576P) Secondary(SDTV 576P)
8		62.5	50	54	17,18	Frame packing Line alternative	Secondary(SDTV 576P) (SDTV 576P)
9		31.25	50	54	17,18	Side-by-side(Full)	(SDTV 576P)
10	1280*720	37.500	50	74.25	19	Top-and-Bottom Side-by-side(half)	Primary(HDTV 720P) Primary(HDTV 720P)
11		75	50	148.5	19	Frame packing Field alternative	Primary(HDTV 720P) (HDTV 720P)
12		37.500	50	148.5	19	Side-by-side(Full)	(HDTV 720P)
13		44.96 / 45	59.94 / 60	74.18/74.25	4	Top-and-Bottom Side-by-side(half)	Primary(HDTV 720P) Primary(HDTV 720P)
14		89.91/90	59.94 / 60	148.35/148.5	4	Frame packing Line alternative	Primary(HDTV 720P) (HDTV 720P)
15		44.96 / 45	59.94 / 60	148.35/148.5	4	Side-by-side(Full)	(HDTV 720P)
16	1920*1080	33.72 / 33.75	59.94 / 60	74.18/74.25	5	Top-and-Bottom Side-by-side(half)	Secondary(HDTV 1080I) Primary(HDTV 1080I)
17		67.432/67.50	59.94 / 60	148.35/148.5	5	Frame packing Line alternative	Primary(HDTV 1080I) (HDTV 1080I)
18		33.72 / 33.75	59.94 / 60	148.35/148.5	5	Side-by-side(Full)	(HDTV 1080I)
19		28.125	50.00	74.25	20	Top-and-Bottom Side-by-side(half)	Secondary(HDTV 1080I) Primary(HDTV 1080I)
20		56.25	50.00	148.5	20	Frame packing Field alternative	Primary(HDTV 1080I) (HDTV 1080I)
21		28.125	50.00	148.5	20	Side-by-side(Full)	(HDTV 1080I)
22		26.97 / 27	23.97 / 24	74.18/74.25	32	Top-and-Bottom Side-by-side(half)	Primary(HDTV 1080P) Primary(HDTV 1080P)
23		43.94/54	23.97 / 24	148.35/148.5	32	Frame packing Field alternative	Primary(HDTV 1080P) (HDTV 1080P)
24		26.97 / 27	23.97 / 24	148.35/148.5	32	Side-by-side(Full)	(HDTV 1080P)
25		28.12	25	74.25	33	Top-and-Bottom Side-by-side(half)	Primary(HDTV 1080P) Primary(HDTV 1080P)
26		56.24	25	148.5	33	Frame packing Line alternative	Primary(HDTV 1080P) (HDTV 1080P)
27		28.12	25	148.5	33	Side-by-side(Full)	(HDTV 1080P)
28		33.716 / 33.75	29.976 / 30.00	74.18/74.25	34	Top-and-Bottom Side-by-side(half)	Secondary(HDTV 1080P) Secondary(HDTV 1080P)
29		67.432 / 67.5	29.976 / 30.00	148.35/148.5	34	Frame packing Line alternative	Secondary(HDTV 1080P) (HDTV 1080P)
30		33.716 / 33.75	29.976 / 30.00	148.35/148.5	34	Side-by-side(Full)	(HDTV 1080P)
31		56.250	50	148.5	31	Top-and-Bottom Side-by-side(half)	Primary(HDTV 1080P) Secondary(HDTV 1080P)
32		67.43 / 67.5	59.94 / 60	148.35/148.50	16	Top-and-Bottom Side-by-side(half)	Primary(HDTV 1080P) Secondary(HDTV 1080P)

## (5) HDMI-PC Input (3D) (3D supported mode manually)

No.	Resolution	H-freq(kHz)	V-freq.(Hz)	Pixel clock(MHz)	3D input proposed mode	Proposed
1	1024*768	48.36	60	65	2D to 3D, Side by Side(half) Top & Bottom	HDTV 768P
2	1360*768	47.71	60	85.5	2D to 3D, Side by Side(half) Top & Bottom	HDTV 768P
3	1920*1080	67.500	60	148.50	2D to 3D, Side by Side(half) Top & Bottom, Checker Board, Single Frame Sequential, Row Interleaving, Column Interleaving	HDTV 1080P
4	Others	-	-	-	2D to 3D	640*350 720*400 640*480 800*600 1152*864

## (6) Component Input ( 3D) (3D supported mode manually)

No.	Resolution	H-freq(kHz)	V-freq.(Hz)	Pixel clock	3D input proposed mode	Proposed
1	1280*720	37.5	50	74.25	2D to 3D, Side by Side, Top & Bottom	HDTV 720P
2	1280*720	45.00	60.00	74.25	2D to 3D, Side by Side, Top & Bottom	HDTV 720P
3	1280*720	44.96	59.94	74.176	2D to 3D, Side by Side, Top & Bottom	HDTV 720P
4	1920*1080	33.75	60.00	74.25	2D to 3D, Side by Side, Top & Bottom	HDTV 1080I
5	1920*1080	33.72	59.94	74.176	2D to 3D, Side by Side, Top & Bottom	HDTV 1080I
6	1920*1080	28.12	50	74.25	2D to 3D, Side by Side, Top & Bottom	HDTV 1080I
7	1920*1080	67.500	60	148.50	2D to 3D, Side by Side, Top & Bottom	HDTV 1080P
8	1920*1080	67.432	59.94	148.352	2D to 3D, Side by Side, Top & Bottom	HDTV 1080P
9	1920*1080	27.000	24.000	74.25	2D to 3D, Side by Side, Top & Bottom	HDTV 1080P
10	1920*1080	28.12	25	74.25	2D to 3D, Side by Side, Top & Bottom	HDTV 1080P
11	1920*1080	56.25	50	74.25	2D to 3D, Side by Side, Top & Bottom	HDTV 1080P
12	1920*1080	26.97	23.976	74.176	2D to 3D, Side by Side, Top & Bottom	HDTV 1080P
13	1920*1080	33.75	30.000	74.25	2D to 3D, Side by Side, Top & Bottom	HDTV 1080P
14	1920*1080	33.71	29.97	74.176	2D to 3D, Side by Side, Top & Bottom	HDTV 1080P

(7) USB, DLNA – Movie (3D) (3D supported mode manually)

No.	Resolution	H-freq(kHz)	V-freq.(Hz)	Pixel clock(MHz)	3D input proposed mode
1	Under 704x480				2D to 3D
2	Over 704x480 interlaced				2D to 3D, Side by Side(Half), Top & Bottom
3	Over 704x480 progressive		50 / 60		2D to 3D, Side by Side(Half), Top & Bottom, Checker Board, Row Interleaving, Column Interleaving, Frame Sequential
4			others		2D to 3D, Side by Side(Half), Top & Bottom, Checker Board, Row Interleaving, Column Interleaving





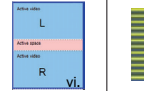



(8) USB, DLNA -Photo (3D) (3D supported mode manually)

No.	Resolution	H-freq(kHz)	V-freq.(Hz)	Pixel clock(MHz)	3D input proposed mode
1	Under 320x240	-	-	-	2D to 3D
2	Over 320x240	-	-	-	2D to 3D, Side by Side(Half), Top & Bottom

(9) USB, DLNA (3D) (3D supported mode automatically)

No.	Resolution	H-freq(kHz)	V-freq.(Hz)	Pixel clock(MHz)	3D input proposed mode
1	1080p	33.75	30	74.25	Side by Side(Half), Top & Bottom, Checker Board, MPO(Photo), JPS(Photo)

■ Remark: 3D Input mode

No.	Side by Side	Top & Bottom	Checker board	Single Frame Sequential	Frame Packing	Line Interleaving	Column Interleaving	2D to 3D
1								



## ADJUSTMENT INSTRUCTION

## 1. Application Range

This specification sheet is applied to all of the LED TV with LD34D chassis.

## 2. Designation

- (1) Because this is not a hot chassis, it is not necessary to use an isolation transformer. However, the use of isolation transformer will help protect test instrument.
- (2) Adjustment must be done in the correct order.
- (3) The adjustment must be performed in the circumstance of  $25^{\circ}\text{C} \pm 5^{\circ}\text{C}$  of temperature and  $65\% \pm 10\%$  of relative humidity if there is no specific designation.
- (4) The input voltage of the receiver must keep AC 100-240 V~, 50/60 Hz.
- (5) The receiver must be operated for about 5 minutes prior to the adjustment when module is in the circumstance of over 15.

In case of keeping module is in the circumstance of 0 °C, it should be placed in the circumstance of above 15 °C for 2 hours.

In case of keeping module is in the circumstance of below  $-20^{\circ}\text{C}$ , it should be placed in the circumstance of above  $15^{\circ}\text{C}$  for 3 hours.

[Caution]

When still image is displayed for a period of 20 minutes or longer (Especially where W/B scale is strong. Digital pattern 13ch and/or Cross hatch pattern 09ch), there can some afterimage in the black level area.

### 3. Automatic Adjustment

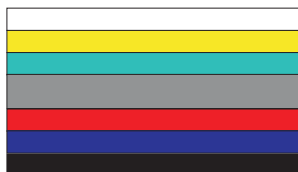
### 3.1. ADC Adjustment

### 3.1.1. Overview

ADC adjustment is needed to find the optimum black level and gain in Analog-to-Digital device and to compensate RGB deviation.

### 3.1.2. Equipment & Condition

- (1) USB to RS-232C Jig
- (2) MSPG-925 Series Pattern Generator(MSPG-925FA,  
pattern - 65)
  - Resolution : 480i Comp1  
1080P Comp1  
1920\*1080P SCART RGB
  - Pattern : Horizontal 100% Color Bar Pattern
  - Pattern level :  $0.7 \pm 0.1$  Vp-p
  - Image



### 3.1.3. Adjustment

- (1) Adjustment method  
- Using RS-232, adjust items in the other shown in  
"3.1.3.3")

- (2) Adj. protocol

Protocol	Command	Set ACK
Enter adj. mode	aa 00 00	a 00 OK00x
Source change	xb 00 04 xb 00 06	b 00 OK04x (Adjust 480i, 1080p Comp1 ) b 00 OK06x (Adjust 1920*1080 SCART RGB)
Begin adj.	ad 00 10	
Return adj. result		OKx (Case of Success) NGx (Case of Fail)
Read adj. data	(main) ad 00 20 (sub ) ad 00 21	(main) 000000000000000000000007c007b006dx (Sub) 00000007000000000000000007c00830077x
Confirm adj.	ad 00 99	NG 03 00x (Fail) NG 03 01x (Fail) NG 03 02x (Fail) OK 03 03x (Success)
End adj.	aa 00 90	a 00 OK90x

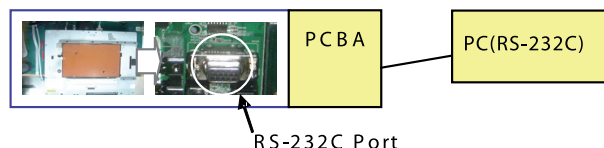
Ref.) ADC Adj. RS232C Protocol Ver1.0

- (3) Adj. order

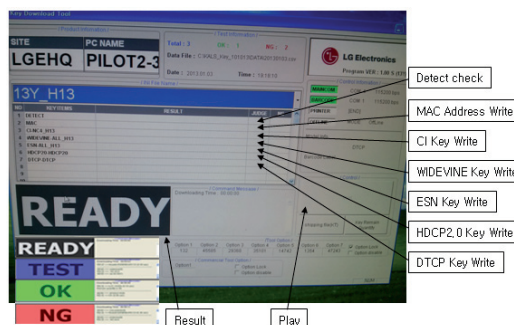
- ```
- aa 00 00 [Enter ADC adj. mode]
- xb 00 04 [Change input source to Component1 (480i&
1080p)]
- ad 00 10 [Adjust 480i&1080p Comp1]
- xb 00 06 [Change input source to RGB(1024*768)]
- ad 00 10 [Adjust 1920*1080 SCART RGB]
- ad 00 90 End adj.
```

### 3.2. MAC address D/L, CI+ key D/L, Widevine key D/L, ESN key D/L, HDCP key D/L, DTCP key D/L

Connect: PCBA Jig → RS-232C Port == PC → RS-232C Port  
Communication Prot connection



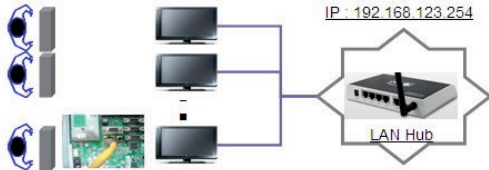
- Com 1,2,3,4 and 115200(Baudrate)  
Mode check: Online Only
- Check the test process: DETECT → MAC → CI → Widevine  
→ ESN → HDCP → DTCP
- Play: START
- Result: Ready, Test, OK or NG
- Printer Out (MAC Address Label)



### 3.3. LAN Inspection

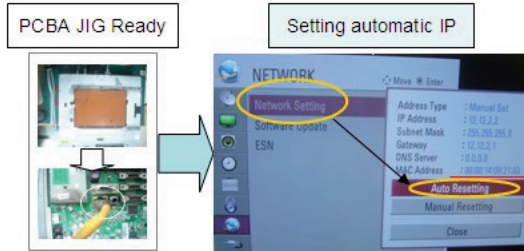
#### 3.3.1. Equipment & Condition

- Each other connection to LAN Port of IP Hub and Jig



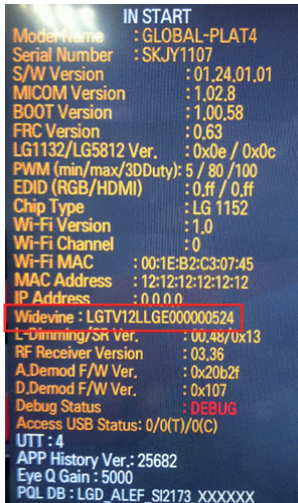
#### 3.3.2. LAN inspection solution

- LAN Port connection with PCB
- Network setting at MENU Mode of TV
- Setting automatic IP
- Setting state confirmation
  - If automatic setting is finished, you confirm IP and MAC Address.



#### 3.3.3. WIDEVINE key Inspection

- Confirm key input data at the "IN START" MENU Mode.



### 3.4. LAN PORT INSPECTION(PING TEST)

Connect SET → LAN port == PC → LAN Port



#### 3.4.1. Equipment setting

- Play the LAN Port Test PROGRAM.
- Input IP set up for an inspection to Test Program.  
\*IP Number : 12.12.2.2

#### 3.4.2. LAN PORT inspection(PING TEST)

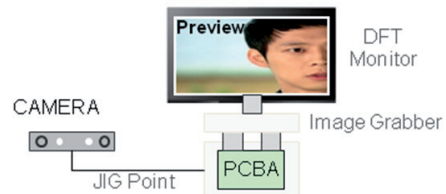
- Play the LAN Port Test Program.
- Connect each other LAN Port Jack.
- Play Test (F9) button and confirm OK Message.
- Remove LAN cable.



### 3.5. Camera Port Inspection

- Objective : To check PCBA's CAMERA Port.
- How-it-works
  - Connect the PCBA like below Picture.
  - Send specific RS-232C command for displaying Camera Preview.

\* CAMERA need to be status of Slide up.



#### 3) RS-232C Command

| RS-232C COMMAND |      |    | Explanation            |
|-----------------|------|----|------------------------|
| CMD             | DATA | ID |                        |
| ai              | 00   | 23 | Camera Function Start. |
| ai              | 00   | 24 | Camera Function End.   |

## 3.6. Model name & Serial number Download

### 3.6.1. Model name & Serial number D/L

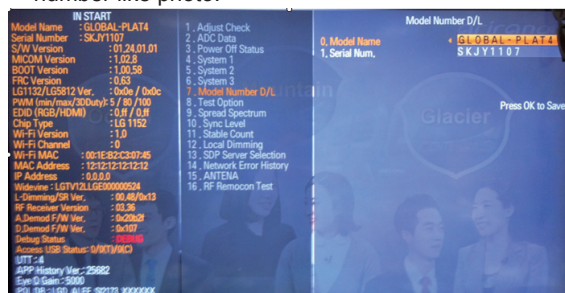
- Press "Power on" key of service remote control.  
(Baud rate : 115200 bps)
- Connect RS-232C Signal to USB Cable to USB.
- Write Serial number by use USB port.
- Must check the serial number at Instart menu.

### 3.6.2. Method & notice

- Serial number D/L is using of scan equipment.
- Setting of scan equipment operated by Manufacturing Technology Group.
- Serial number D/L must be conformed when it is produced in production line, because serial number D/L is mandatory by D-book 4.0.

\* Manual Download (Model Name and Serial Number)  
If the TV set is downloaded by OTA or service man, sometimes model name or serial number is initialized.(Not always)  
It is impossible to download by bar code scan, so It need Manual download.

- Press the "Instart" key of Adjustment remote control.
- Go to the menu "7.Model Number D/L" like below photo.
- Input the Factory model name(ex 47LM960V-ZB) or Serial number like photo.



- Check the model name Instart menu. → Factory name displayed. (ex 47LM960V-ZB)
- Check the Diagnostics.(DTV country only) → Buyer model displayed. (ex 47LM960V-ZB)

## 3.7. CI+ Key checking method

\* Check the Section 3.2

Check whether the key was downloaded or not at 'In Start' menu. (Refer to below).



=> Check the Download to CI+ Key value in LGset.

### 3.7.1. Check the method of CI+ Key value

- Check the method on Instart menu
- Check the method of RS232C Command
  - Into the main ass'y mode(RS232: aa 00 00)

| CMD 1 | CMD 2 | Data 0 |
|-------|-------|--------|
| A     | A     | 0 0    |

- Check the key download for transmitted command (RS232: ci 00 10)

| CMD 1 | CMD 2 | Data 0 |
|-------|-------|--------|
| C     | I     | 1 0    |

- Result value

- Normally status for download : OKx
- Abnormally status for download : NGx

### 3.7.2. Check the method of CI+ key value(RS232)

- Into the main ass'y mode(RS232: aa 00 00)

| CMD 1 | CMD 2 | Data 0 |
|-------|-------|--------|
| A     | A     | 0 0    |

- Check the method of CI+ key by command (RS232: ci 00 20)

| CMD 1 | CMD 2 | Data 0 |
|-------|-------|--------|
| C     | I     | 2 0    |

- Result value

i 01 OK 1d1852d21c1ed5dcx

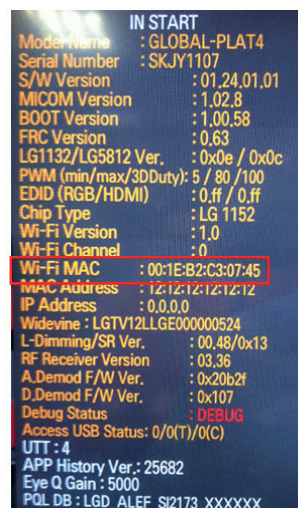
→ CI+ Key Value

## 3.8. WIFI MAC ADDRESS CHECK

- Using RS232 Command

|              | H-freq(kHz)            | V-freq.(Hz)       |
|--------------|------------------------|-------------------|
| Transmission | [A][I][Set ID][20][Cr] | [O][K][X] or [NG] |

- Check the menu on in-start



## 4. Manual Adjustment

\* ADC adjustment is not needed because of OTP(Auto ADC adjustment)

### 4.1. EDID(The Extended Display Identification Data)/DDC(Display Data Channel) download

#### 4.1.1. Overview

It is a VESA regulation. A PC or a MNT will display an optimal resolution through information sharing without any necessity of user input. It is a realization of "Plug and Play".

#### 4.1.2. Equipment

- Since embedded EDID data is used, EDID download JIG, HDMI cable and D-sub cable are not need.
- Adjustment remote control

#### 4.1.3. Download method

- (1) Press "ADJ" key on the Adjustment remote control then select "10.EDID D/L", By pressing "Enter" key, enter EDID D/L menu.
- (2) Select "Start" button by pressing "Enter" key, HDMI1/ HDMI2/ HDMI3/ HDMI4/ RGB are writing and display OK or NG.



#### 4.1.4. EDID DATA

##### • HDMI

|      | 0x00 | 0x01 | 0x02 | 0x03 | 0x04 | 0x05 | 0x06 | 0x07 | 0x08 | 0x09 | 0x0A | 0x0B | 0x0C | 0x0D | 0x0E | 0x0F |
|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 0x00 | 00   | FF   | FF   | FF   | FF   | FF   | FF   | 00   | 1E   | 6D   | (a)  |      | (b)  |      |      |      |
| 0x01 | (c)  |      | 01   | 03   | 80   | A0   | 5A   | 78   | 0A   | EE   | 91   | A3   | 54   | 4C   | 99   | 26   |
| 0x02 | 0F   | 50   | 54   | A1   | 08   | 00   | 31   | 40   | 45   | 40   | 61   | 40   | 71   | 40   | 81   | 80   |
| 0x03 | 01   | 01   | 01   | 01   | 01   | 01   | 02   | 3A   | 80   | 18   | 71   | 38   | 2D   | 40   | 58   | 2C   |
| 0x04 | 45   | 00   | 40   | 84   | 63   | 00   | 00   | 1E   | 66   | 21   | 50   | B0   | 51   | 00   | 1B   | 30   |
| 0x05 | 40   | 70   | 36   | 00   | 40   | 84   | 63   | 00   | 1E   | 00   | 00   | 00   | FD   | 00   | 3A   |      |
| 0x06 | 3E   | 1E   | 53   | 10   | 00   | 0A   | 20   | 20   | 20   | 20   | 20   | 20   | (d)  |      |      |      |
| 0x07 | (d)  |      |      |      |      |      |      |      |      |      |      |      |      |      |      | (e)1 |
| 0x08 | 02   | 03   | 3A   | F1   | 4E   | 10   | 9F   | 04   | 13   | 05   | 14   | 03   | 02   | 12   | 20   | 21   |
| 0x09 | 22   | 15   | 01   | 29   | 3D   | 06   | C0   | 15   | 07   | 50   | 09   | 57   | 07   | (f)  |      |      |
| 0x0A | (f)  |      |      |      |      | E3   | 05   | 03   | 01   | 02   | 3A   | 80   | 18   | 71   | 38   | 40   |
| 0x0B | 2D   | 40   | 58   | 2C   | 45   | 00   | 40   | 84   | 63   | 00   | 00   | 1E   | 01   | 1D   | 80   | 18   |
| 0x0C | 71   | 1C   | 16   | 20   | 58   | 2C   | 25   | 00   | 40   | 84   | 63   | 00   | 00   | 9E   | 01   | 1D   |
| 0x0D | 00   | 72   | 51   | D0   | 1E   | 20   | 6E   | 28   | 55   | 00   | 40   | 84   | 63   | 00   | 00   | 1E   |
| 0x0E | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | 00   | (e)2 |

##### • Reference

- HDMI1 ~ HDMI4
- In the data of EDID, bellows may be different by S/W or Input mode.

##### (a) Product ID

| MODEL NAME   | HEX  | EDID Table | DDC Function   |
|--------------|------|------------|----------------|
| HD/FHD Model | 0001 | 01 00      | Analog/Digital |

(b) Serial No: Controlled on production line.

(c) Month, Year: Controlled on production line:

ex) Monthly : '01' → '01', Year : '2013' → '17'

(d) Model Name(Hex): LGTV

Cf) TV set's model name in EDID data is below.

| MODEL NAME | MODEL NAME(HEX)                                            |
|------------|------------------------------------------------------------|
| LG TV      | 00 00 00 FC 00 4C 47 20 54 56 0A 20 20 20 20 20 20 (LG TV) |

(e) Checksum(LG TV): Changeable by total EDID data.

| EDID C/S data   |         | FHD        |
|-----------------|---------|------------|
|                 |         | HDMI       |
| check sum (Hex) | Block 0 | 42         |
|                 | Block 1 | 23 (HDMI1) |
|                 |         | 13 (HDMI2) |

(f) Vendor Specific(HDMI)

| INPUT | MODEL NAME(HEX)  |
|-------|------------------|
| HDMI1 | 78030C001000801E |
| HDMI2 | 78030C002000801E |

(1) EDID

# HDMI 1(C/S : E8 81)

EDID Block 0, Bytes 0-127 [00H-7FH]

|    | 0  | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | A  | B  | C  | D  | E  | F  |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 00 | 00 | FF | FF | FF | FF | FF | FF | 00 | 1E | 6D | 01 | 00 | 01 | 01 | 01 | 01 |
| 10 | 01 | 17 | 01 | 03 | 80 | A0 | 5A | 78 | 0A | EE | 91 | A3 | 54 | 4C | 99 | 26 |
| 20 | 0F | 50 | 54 | A1 | 08 | 00 | 31 | 40 | 45 | 40 | 61 | 40 | 71 | 40 | 81 | 80 |
| 30 | 01 | 01 | 01 | 01 | 01 | 01 | 02 | 3A | 80 | 18 | 71 | 38 | 2D | 40 | 58 | 2C |
| 40 | 45 | 00 | 40 | 84 | 63 | 00 | 00 | 1E | 66 | 21 | 50 | B0 | 51 | 00 | 1B | 30 |
| 50 | 40 | 70 | 36 | 00 | 40 | 84 | 63 | 00 | 00 | 1E | 00 | 00 | 00 | FD | 00 | 3A |
| 60 | 3E | 1E | 53 | 10 | 00 | 0A | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 00 | 00 | FC |
| 70 | 00 | 4C | 47 | 20 | 54 | 56 | 0A | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 01 | E8 |

EDID Block 1, Bytes 128-255 [80H-FFH]

|    | 0  | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | A  | B  | C  | D  | E  | F  |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 80 | 02 | 03 | 3A | F1 | 4E | 10 | 9F | 04 | 13 | 05 | 14 | 03 | 02 | 12 | 20 | 21 |
| 90 | 22 | 15 | 01 | 29 | 3D | 06 | C0 | 15 | 07 | 50 | 09 | 57 | 07 | 78 | 03 | 0C |
| A0 | 00 | 10 | 00 | B8 | 2D | 20 | C0 | 0E | 01 | 4F | 3F | FC | 08 | 10 | 18 | 10 |
| B0 | 06 | 10 | 16 | 10 | 28 | 10 | E3 | 05 | 03 | 01 | 02 | 3A | 80 | 18 | 71 | 38 |
| C0 | 2D | 40 | 58 | 2C | 45 | 00 | 40 | 84 | 63 | 00 | 00 | 1E | 01 | 1D | 80 | 18 |
| D0 | 71 | 1C | 16 | 20 | 58 | 2C | 25 | 00 | 40 | 84 | 63 | 00 | 00 | 9E | 01 | 1D |
| E0 | 00 | 72 | 51 | D0 | 1E | 20 | 6E | 28 | 55 | 00 | 40 | 84 | 63 | 00 | 00 | 1E |
| F0 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 81 |

# HDMI 2(C/S : E8 71)

EDID Block 0, Bytes 0-127 [00H-7FH]

|    | 0  | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | A  | B  | C  | D  | E  | F  |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 00 | 00 | FF | FF | FF | FF | FF | FF | 00 | 1E | 6D | 01 | 00 | 01 | 01 | 01 | 01 |
| 10 | 01 | 17 | 01 | 03 | 80 | A0 | 5A | 78 | 0A | EE | 91 | A3 | 54 | 4C | 99 | 26 |
| 20 | 0F | 50 | 54 | A1 | 08 | 00 | 31 | 40 | 45 | 40 | 61 | 40 | 71 | 40 | 81 | 80 |
| 30 | 01 | 01 | 01 | 01 | 01 | 01 | 02 | 3A | 80 | 18 | 71 | 38 | 2D | 40 | 58 | 2C |
| 40 | 45 | 00 | 40 | 84 | 63 | 00 | 00 | 1E | 66 | 21 | 50 | B0 | 51 | 00 | 1B | 30 |
| 50 | 40 | 70 | 36 | 00 | 40 | 84 | 63 | 00 | 00 | 1E | 00 | 00 | 00 | FD | 00 | 3A |
| 60 | 3E | 1E | 53 | 10 | 00 | 0A | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 00 | 00 | FC |
| 70 | 00 | 4C | 47 | 20 | 54 | 56 | 0A | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 01 | E8 |

EDID Block 1, Bytes 128-255 [80H-FFH]

| 0  | 0  | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | A  | B  | C  | D  | E  | F  |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 00 | 02 | 03 | 37 | F1 | 4E | 10 | 9F | 04 | 13 | 05 | 14 | 03 | 02 | 12 | 20 | 21 |
| 10 | 22 | 15 | 01 | 26 | 15 | 07 | 50 | 09 | 57 | 07 | 78 | 03 | 0C | 00 | 20 | 00 |
| 20 | B8 | 2D | 20 | C0 | 0E | 01 | 4F | 3F | FC | 08 | 10 | 18 | 10 | 06 | 10 | 16 |
| 30 | 10 | 28 | 10 | E3 | 05 | 03 | 01 | 02 | 3A | 80 | 18 | 71 | 38 | 2D | 40 | 58 |
| 40 | 2C | 45 | 00 | A0 | 5A | 00 | 00 | 00 | 1E | 01 | 1D | 80 | 18 | 71 | 1C | 16 |
| 50 | 20 | 58 | 2C | 25 | 00 | A0 | 5A | 00 | 00 | 00 | 9E | 01 | 1D | 00 | 72 | 51 |
| 60 | D0 | 1E | 20 | 6E | 28 | 55 | 00 | A0 | 5A | 00 | 00 | 00 | 1E | 00 | 00 | 00 |
| 70 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 01 |



#### # HDMI 3(C/S : E8 61)

##### EDID Block 0, Bytes 0-127 [00H-7FH]

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 0  | 0  | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | A  | B  | C  | D  | E  | F  |
| 00 | 00 | FF | FF | FF | FF | FF | FF | 00 | 1E | 6D | 01 | 00 | 01 | 01 | 01 | 01 |
| 10 | 01 | 17 | 01 | 03 | 80 | A0 | 5A | 78 | 0A | EE | 91 | A3 | 54 | 4C | 99 | 26 |
| 20 | 0F | 50 | 54 | A1 | 08 | 00 | 31 | 40 | 45 | 40 | 61 | 40 | 71 | 40 | 81 | 80 |
| 30 | 01 | 01 | 01 | 01 | 01 | 01 | 02 | 3A | 80 | 18 | 71 | 38 | 2D | 40 | 58 | 2C |
| 40 | 45 | 00 | 40 | 84 | 63 | 00 | 00 | 1E | 66 | 21 | 50 | B0 | 51 | 00 | 1B | 30 |
| 50 | 40 | 70 | 36 | 00 | 40 | 84 | 63 | 00 | 00 | 1E | 00 | 00 | 00 | FD | 00 | 3A |
| 60 | 3E | 1E | 53 | 10 | 00 | 0A | 20 | 20 | 20 | 20 | 20 | 20 | 00 | 00 | 00 | FC |
| 70 | 00 | 4C | 47 | 20 | 54 | 56 | 0A | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 01 | E8 |

##### EDID Block 1, Bytes 128-255 [80H-FFH]

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 0  | 0  | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | A  | B  | C  | D  | E  | F  |
| 00 | 02 | 03 | 3A | F1 | 4E | 10 | 9F | 04 | 13 | 05 | 14 | 03 | 02 | 12 | 20 | 21 |
| 10 | 22 | 15 | 01 | 29 | 3D | 06 | C0 | 15 | 07 | 50 | 09 | 57 | 07 | 78 | 03 | 0C |
| 20 | 00 | 30 | 00 | B8 | 2D | 20 | C0 | 0E | 01 | 4F | 3F | FC | 08 | 10 | 18 | 10 |
| 30 | 06 | 10 | 16 | 10 | 28 | 10 | E3 | 05 | 03 | 01 | 02 | 3A | 80 | 18 | 71 | 38 |
| 40 | 2D | 40 | 58 | 2C | 45 | 00 | 40 | 84 | 63 | 00 | 00 | 1E | 01 | 1D | 80 | 18 |
| 50 | 71 | 1C | 16 | 20 | 58 | 2C | 25 | 00 | 40 | 84 | 63 | 00 | 00 | 9E | 01 | 1D |
| 60 | 00 | 72 | 51 | D0 | 1E | 20 | 6E | 28 | 55 | 00 | 40 | 84 | 63 | 00 | 00 | 1E |
| 70 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 61 |

#### # HDMI 4(C/S : E8 51)

##### EDID Block 0, Bytes 0-127 [00H-7FH]

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 0  | 0  | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | A  | B  | C  | D  | E  | F  |
| 00 | 00 | FF | FF | FF | FF | FF | FF | 00 | 1E | 6D | 01 | 00 | 01 | 01 | 01 | 01 |
| 10 | 01 | 17 | 01 | 03 | 80 | A0 | 5A | 78 | 0A | EE | 91 | A3 | 54 | 4C | 99 | 26 |
| 20 | 0F | 50 | 54 | A1 | 08 | 00 | 31 | 40 | 45 | 40 | 61 | 40 | 71 | 40 | 81 | 80 |
| 30 | 01 | 01 | 01 | 01 | 01 | 01 | 02 | 3A | 80 | 18 | 71 | 38 | 2D | 40 | 58 | 2C |
| 40 | 45 | 00 | 40 | 84 | 63 | 00 | 00 | 1E | 66 | 21 | 50 | B0 | 51 | 00 | 1B | 30 |
| 50 | 40 | 70 | 36 | 00 | 40 | 84 | 63 | 00 | 00 | 1E | 00 | 00 | 00 | FD | 00 | 3A |
| 60 | 3E | 1E | 53 | 10 | 00 | 0A | 20 | 20 | 20 | 20 | 20 | 20 | 00 | 00 | 00 | FC |
| 70 | 00 | 4C | 47 | 20 | 54 | 56 | 0A | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 01 | E8 |

##### EDID Block 1, Bytes 128-255 [80H-FFH]

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 0  | 0  | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | A  | B  | C  | D  | E  | F  |
| 00 | 02 | 03 | 3A | F1 | 4E | 10 | 9F | 04 | 13 | 05 | 14 | 03 | 02 | 12 | 20 | 21 |
| 10 | 22 | 15 | 01 | 29 | 3D | 06 | C0 | 15 | 07 | 50 | 09 | 57 | 07 | 78 | 03 | 0C |
| 20 | 00 | 40 | 00 | B8 | 2D | 20 | C0 | 0E | 01 | 4F | 3F | FC | 08 | 10 | 18 | 10 |
| 30 | 06 | 10 | 16 | 10 | 28 | 10 | E3 | 05 | 03 | 01 | 02 | 3A | 80 | 18 | 71 | 38 |
| 40 | 2D | 40 | 58 | 2C | 45 | 00 | 40 | 84 | 63 | 00 | 00 | 1E | 01 | 1D | 80 | 18 |
| 50 | 71 | 1C | 16 | 20 | 58 | 2C | 25 | 00 | 40 | 84 | 63 | 00 | 00 | 9E | 01 | 1D |
| 60 | 00 | 72 | 51 | D0 | 1E | 20 | 6E | 28 | 55 | 00 | 40 | 84 | 63 | 00 | 00 | 1E |
| 70 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 51 |

## 4.2. White Balance Adjustment

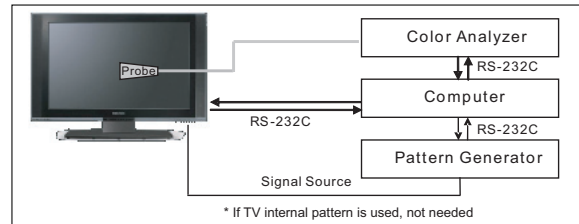
### 4.2.1. Overview

- W/B adj. Objective & How-it-works
  - Objective: To reduce each Panel's W/B deviation
  - How-it-works : When R/G/B gain in the OSD is at 192, it means the panel is at its Full Dynamic Range. In order to prevent saturation of Full Dynamic range and data, one of R/G/B is fixed at 192, and the other two is lowered to find the desired value.
  - Adjustment condition : normal temperature
    - Surrounding Temperature : 25 °C ± 5 °C
    - Warm-up time: About 5 Min
    - Surrounding Humidity : 20 % ~ 80 %

### 4.2.2. Equipment

- Color Analyzer: CA-210 (LED Module : CH 14)
  - Adjustment Computer(During auto adj., RS-232C protocol is needed)
  - Adjustment Remote control
  - Video Signal Generator MSPG-925F 720p/216-Gray (Model: 217, Pattern: 78)
    - Only when internal pattern is not available
- Color Analyzer Matrix should be calibrated using CS-100.

### 4.2.3. Equipment connection MAP



### 4.2.4. Adj. Command (Protocol)

#### <Command Format>

| START | 6E | A | 50 | A | LEN | A | 03 | A | CMD | A | 00 | A | VAL | A | CS | STOP |
|-------|----|---|----|---|-----|---|----|---|-----|---|----|---|-----|---|----|------|
|-------|----|---|----|---|-----|---|----|---|-----|---|----|---|-----|---|----|------|

- LEN: Number of Data Byte to be sent
  - CMD: Command
  - VAL: FOS Data value
  - CS: Checksum of sent data
  - A: Acknowledge
- Ex) [Send: JA\_00\_DD] / [Ack: A\_00\_okDDX]

- RS-232C Command used during auto-adjustment.

| RS-232C COMMAND<br>[CMD ID DATA] |    |    | Explanation                                                    |
|----------------------------------|----|----|----------------------------------------------------------------|
| wb                               | 00 | 00 | Begin White Balance adjustment                                 |
| wb                               | 00 | 10 | Gain adjustment(internal white pattern)                        |
| wb                               | 00 | 1f | Gain adjustment completed                                      |
| wb                               | 00 | 20 | Offset adjustment(internal white pattern)                      |
| wb                               | 00 | 2f | Offset adjustment completed                                    |
| wb                               | 00 | ff | End White Balance adjustment<br>(internal pattern disappears ) |

- Ex) wb 00 00 -> Begin white balance auto-adj.  
 wb 00 10 -> Gain adj.  
 ja 00 ff -> Adj. data  
 jb 00 c0  
 ...  
 ...  
 wb 00 1f → Gain adj. completed  
 \*(wb 00 20(Start), wb 00 2f(end)) → Off-set adj.  
 wb 00 ff → End white balance auto-adj.

▪ Adj. Map

|        | Adj. item | Command<br>(lower caseASCII) |      | Data Range<br>(Hex.) |     | Default<br>(Decimal) |
|--------|-----------|------------------------------|------|----------------------|-----|----------------------|
|        |           | CMD1                         | CMD2 | MIN                  | MAX |                      |
| Cool   | R Gain    | j                            | g    | 00                   | C0  |                      |
|        | G Gain    | j                            | h    | 00                   | C0  |                      |
|        | B Gain    | j                            | i    | 00                   | C0  |                      |
|        | R Cut     |                              |      |                      |     |                      |
|        | G Cut     |                              |      |                      |     |                      |
|        | B Cut     |                              |      |                      |     |                      |
| Medium | R Gain    | j                            | a    | 00                   | C0  |                      |
|        | G Gain    | j                            | b    | 00                   | C0  |                      |
|        | B Gain    | j                            | c    | 00                   | C0  |                      |
|        | R Cut     |                              |      |                      |     |                      |
|        | G Cut     |                              |      |                      |     |                      |
|        | B Cut     |                              |      |                      |     |                      |
| Warm   | R Gain    | j                            | d    | 00                   | C0  |                      |
|        | G Gain    | j                            | e    | 00                   | C0  |                      |
|        | B Gain    | j                            | f    | 00                   | C0  |                      |
|        | R Cut     |                              |      |                      |     |                      |
|        | G Cut     |                              |      |                      |     |                      |

#### 4.2.5. Adj. method

(1) Auto adj. method

- 1) Set TV in adj. mode using POWER ON key.
- 2) Zero calibrate probe then place it on the center of the Display.
- 3) Connect Cable.(RS-232C to USB)
- 4) Select mode in adj. Program and begin adj.
- 5) When adj. is complete (OK Sign), check adj. status pre mode. (Warm, Medium, Cool)
- 6) Remove probe and RS-232C cable to complete adj.
  - W/B Adj. must begin as start command "wb 00 00" , and finish as end command "wb 00 ff", and Adj. offset if need.

(2) Manual adjustment. method

- 1) Set TV in Adj. mode using POWER ON.
- 2) Zero Calibrate the probe of Color Analyzer, then place it on the center of LCD module within 10 cm of the surface.
- 3) Press ADJ key → EZ adjust using adj. R/C → 9. White-Balance then press the cursor to the right(key ►). When right key(►) is pressed 216 Gray internal pattern will be displayed
- 4) Adjust Cool modes
  - a. Fix the one of R/G/B gain to 192 (default data) and decrease the others. ( If G gain is adjusted over 172 and R and B gain less than 192 , Adjust is O.K.)
  - b. If G gain is less than 172, Increase G gain by up to 172, and then increase R gain and G gain same amount of increasing G gain.
  - c. If R gain or B gain is over 255, Readjust G gain less than 172, Conform to R gain is 255 or B gain is 255
- 5) Adjust two modes(Medium/Warm) Fix the one of R/G/B gain to 192(default data) and decrease the others.
- 6) Adj. is completed, Exit adjust mode using "EXIT" key on Remote controller.
  - If internal pattern is not available, use RF input. In EZ Adj. menu 6.White Balance, you can select one of 2 Test-pattern: ON, OFF. Default is inner(ON). By selecting OFF, you can adjust using RF signal in 206 Gray pattern.

\* CASE Cool

First adjust the coordinate far away from the target value(x, y).

1. x, y > target
  - i) Decrease the R, G.
2. x, y < target
  - i) First decrease the B gain,
3. x > target, y < target
  - i) First decrease B, so make y a little more than the target.
  - ii) Adjust x value by decreasing the R
4. x < target, y > target
  - i) First decrease B, so make x a little more than the target.
  - ii) Adjust x value by decreasing the G

How to adjust

1. If G gain is adjusted over 172 and R gain and B gain less than 192 , Adjust is O.K.
2. If G gain is less than 172 , increase G gain by up to 172, and then increase R gain and B gain same amount of increasing G gain.
3. If R gain or B gain is over 255 , Readjust G gain less than 172, Conform to R gain is 255 or B gain is 255

\* CASE Medium / Warm

First adjust the coordinate far away from the target value(x, y).

1. x, y > target
  - i) Decrease the R, G.
2. x, y < target
  - i) First decrease the B gain,
  - ii) Decrease the one of the others.
3. x > target, y < target
  - i) First decrease B, so make y a little more than the target.
  - ii) Adjust x value by decreasing the R
4. x < target, y > target
  - i) First decrease B, so make x a little more than the target.
  - ii) Adjust y value by decreasing the G

▪ Adjustment condition and cautionary items

- 1) Lighting condition in surrounding area
 

Surrounding lighting should be lower 10 lux. Try to isolate adj. area into dark surrounding.
- 2) Probe location
 

: Color Analyzer(CA-210) probe should be within 10 cm and perpendicular of the module surface (80° ~ 100°)
- 3) Aging time
  - After Aging Start, Keep the Power ON status during 5 Minutes.
  - In case of LCD, Back-light on should be checked using no signal or Full-white pattern.

#### 4.2.6. Reference (White balance Adj. coordinate and color temperature)

- Luminance : 206 Gray
- Standard color coordinate and temperature using CS-1000 (over 26 inch)

| Mode   | Coordinate |       | Temp    | Δuv    |
|--------|------------|-------|---------|--------|
|        | x          | y     |         |        |
| Cool   | 0.271      | 0.270 | 13000 K | 0.0000 |
| Medium | 0.285      | 0.293 | 9300 K  | 0.0000 |
| Warm   | 0.310      | 0.325 | 6500 K  | 0.0000 |

▪ Standard color coordinate and temperature using CA-210(CH 18)

| Mode   | Coordinate  |             | Temp   | $\Delta uv$ |
|--------|-------------|-------------|--------|-------------|
|        | x           | y           |        |             |
| Cool   | 0.271±0.002 | 0.270±0.002 | 13000K | 0.0000      |
| Medium | 0.285±0.002 | 0.293±0.002 | 9300K  | 0.0000      |
| Warm   | 0.310±0.002 | 0.325±0.002 | 6500K  | 0.0000      |

#### 4.2.7. EDGE LED White balance table

- (1) EDGE LED module change color coordinate because of aging time.
- (2) Apply under the color coordinate table, for compensated aging time.
- (3) Normal line(Edge)  
- Gumi (Mar ~ Dec) & Global

| GP4 | Aging time (Min) | Cool |     | Medium |     | Warm |     |
|-----|------------------|------|-----|--------|-----|------|-----|
|     |                  | X    | y   | x      | y   | x    | y   |
|     |                  | 271  | 270 | 285    | 293 | 313  | 329 |
| 1   | 0-2              | 281  | 287 | 295    | 310 | 320  | 342 |
| 2   | 3-5              | 280  | 285 | 294    | 308 | 319  | 340 |
| 3   | 6-9              | 278  | 284 | 292    | 307 | 317  | 339 |
| 4   | 10-19            | 276  | 281 | 290    | 304 | 315  | 336 |
| 5   | 20-35            | 275  | 277 | 289    | 300 | 314  | 332 |
| 6   | 36-49            | 274  | 274 | 288    | 297 | 313  | 329 |
| 7   | 50-79            | 273  | 272 | 287    | 295 | 312  | 327 |
| 8   | 80-119           | 272  | 271 | 286    | 294 | 311  | 326 |
| 9   | Over 120         | 271  | 270 | 285    | 293 | 310  | 325 |

#### (4) Aging Chamber(Edge)

| GP4 | Aging time (Min) | Cool |     | Medium |     | Warm |     |
|-----|------------------|------|-----|--------|-----|------|-----|
|     |                  | X    | y   | x      | y   | x    | y   |
|     |                  | 271  | 270 | 285    | 293 | 313  | 329 |
| 1   | 0-5              | 280  | 285 | 294    | 308 | 319  | 340 |
| 2   | 6-10             | 276  | 280 | 290    | 303 | 315  | 335 |
| 3   | 11-20            | 272  | 275 | 286    | 298 | 311  | 330 |
| 4   | 21-30            | 269  | 272 | 283    | 295 | 308  | 327 |
| 5   | 31-40            | 267  | 268 | 281    | 291 | 306  | 323 |
| 6   | 41-50            | 266  | 265 | 280    | 288 | 305  | 320 |
| 7   | 51-80            | 265  | 263 | 279    | 286 | 304  | 318 |
| 8   | 81-119           | 264  | 261 | 278    | 284 | 303  | 316 |
| 9   | Over 120         | 264  | 260 | 278    | 283 | 303  | 315 |

### 4.3. Local Dimming Function Check

Step 1) Turn on TV.

Step 2) At the Local Dimming mode, module Edge Backlight moving right to left Back light of IOP module moving.

Step 3) Confirm the Local Dimming mode.

Step 4) Press "exit" key.



Local Dimming Demo.  
(Edge LED Model)

### 4.4. Magic Motion Remote control test

- (1) Equipment : RF Remote control for test, IR-KEY-Code Remote control for test
- (2) You must confirm the battery power of RF-Remote control before test(recommend that change the battery per every lot)
- (3) Sequence (test)
  - 1) if you select the "Start(Mute)" key on the Adjustment remote control, you can pairing with the TV SET.
  - 2) You can check the cursor on the TV Screen, when select the "OK" key on the Adjustment remote control.
  - 3) You must remove the pairing with the TV Set by select "OK" key + "Mute" key on the Adjustment remote control for 5 seconds.

### 4.5. 3D function test

(Pattern Generator MSHG-600, MSPG-6100[Support HDMI1.4])

\* HDMI mode NO. 872 , pattern No.83

- (1) Please input 3D test pattern like below.



- (2) When 3D OSD appear automatically, then select OK key.



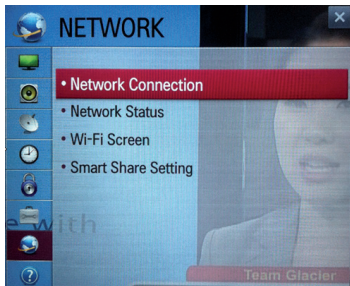
- (3) Don't wear a 3D Glasses, check the picture like below.



## 4.6. Wi-Fi Test

Step 1) Turn on TV

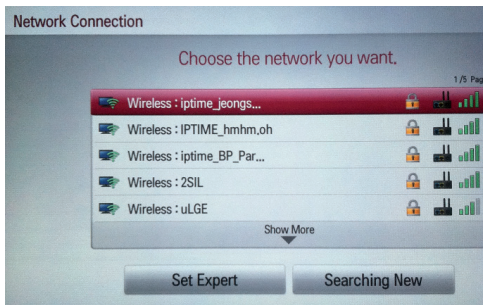
Step 2) Select Network Connection option in Network Menu.



Step 3) Select Start Connection button in Network Connection.



Step 4) If the system finds any AP like blow PIC, it is working well.



## 4.7. LNB voltage and 22KHz tone check

(only for DVB-S/S2 model)

▪ Test method

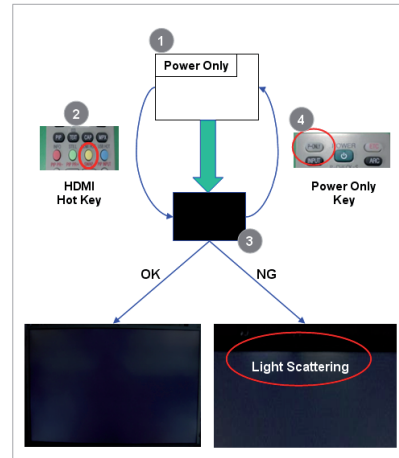
- (1) Set TV in Adj. mode using POWER ON.
- (2) Connect cable between satellite ANT and test JIG.
- (3) Press Yellow key(ETC+SWAP) in Adj Remote control to make LNB on.
- (4) Check LED light 'ON' at 18 V menu.
- (5) Check LED light 'ON' at 22 KHz tone menu.
- (6) Press Blue key(ETC+PIP INPUT) in Adjustment Remote control to make LNB off.
- (7) Check LED light 'OFF' at 18 V menu.
- (8) Check LED light 'OFF' at 22 KHz tone menu.

▪ Test result

- (1) After press LNB On key, '18 V LED' and '22 KHz tone LED' should be ON.
- (2) After press LNB OFF key, '18 V LED' and '22 KHz tone LED' should be OFF.

## 4.8. Inspection of light scattering

▪ Test Method



- (1) Push "Power only" key.
- (2) Push "HDMI" hot key.
- (3) Inspect whether light scattering is occurred in internal black pattern or not.
- (4) Push "Power only" key.

## 4.9. Option selection per country

### 4.9.1. Overview

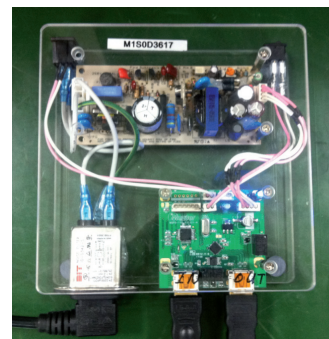
- Option selection is only done for models in Non-EU.

### 4.9.2. Method

- (1) Press ADJ key on the Adjustment Remote Control, then select Country Group Menu
- (2) Depending on destination, select Country Group Code 04 or Country Group EU then on the lower Country option, select US, CA, MX. Selection is done using +, - or ►◄ key.

## 4.10. MHL Test

- (1) Turn on TV
- (2) Select HDMI4 mode using input Menu.
- (3) Set MHL Zig(M1S0D3617) using MHL input, output and power cord.
- (4) Connect HDMI cable between MHL Zig and HDMI4 port.
- (5) Check LED light of Zig and Module of Set.



Result) If, the LED light is green and the Module shows normal stream → OK, Else → NG



#### 4.11. HDMI ARC Function Inspection

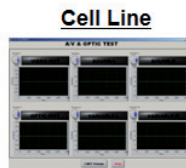
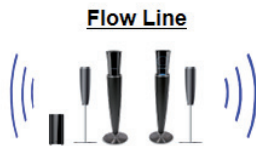
- (1) Test equipment
  - Optic Receiver Speaker
  - MSHG-600 (SW: 1220 ↑)
  - HDMI Cable (for 1.4 version)
- (2) Test method
  - 1) Insert the HDMI Cable to the HDMI ARC port from the master equipment (HDMI1)



- 2) Check the sound from the TV Set



- 3) Check the Sound from the Speaker or using AV & Optic TEST program (It's connected to MSHG-600)

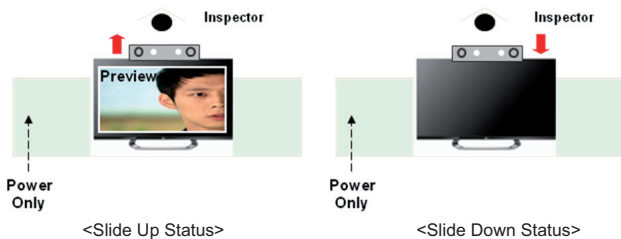


\* Remark: Inspect in Power Only Mode and check SW version in a master equipment



#### 4.12. Camera Function Inspection

- (1) Objective : To check how it connects between Camera and PCBA normally, and their Function
- (2) Test Method : This Inspection is available only Power-Only Status.
  - 1) Slide Camera Up.
  - 2) Camera's Preview picture appears on TV Set.
  - 3) Slide Camera Down.



#### 4.13. Ship-out mode check(In-stop)

- After final inspection, press "IN-STOP" key of the Adjustment remote control and check that the unit goes to Stand-by mode.

#### 4.14. Tool Option selection

- Method: Press ADJ key on the Adj. R/C, then select Tool option.

#### 4.15. GND and Internal Pressure check

##### 4.15.1. Method

- (1) GND & Internal Pressure auto-check preparation
  - Check that Power cord is fully inserted to the SET. (If loose, re-insert)
- (2) Perform GND & Internal Pressure auto-check
  - Unit fully inserted Power cord, Antenna cable and A/V arrive to the auto-check process.
  - Connect D-terminal to AV JACK TESTER
  - Auto CONTROLLER(GWS103-4) ON
  - Perform GND TEST
  - If NG, Buzzer will sound to inform the operator.
  - If OK, changeover to I/P check automatically. (Remove CORD, A/V form AV JACK BOX.)
  - Perform I/P test
  - If NG, Buzzer will sound to inform the operator.
  - If OK, Good lamp will lit up and the stopper will allow the pallet to move on to next process.

##### 4.15.2. Checkpoint

- TEST voltage
  - GND: 1.5 KV / min at 100 mA
  - SIGNAL: 3 KV / min at 100 mA
- TEST time: 1 second
- TEST POINT
  - GND TEST = POWER CORD GND & SIGNAL CABLE METAL GND
  - Internal Pressure TEST = POWER CORD GND & LIVE & NEUTRAL
- LEAKAGE CURRENT: At 0.5 mArms

#### 5. Audio

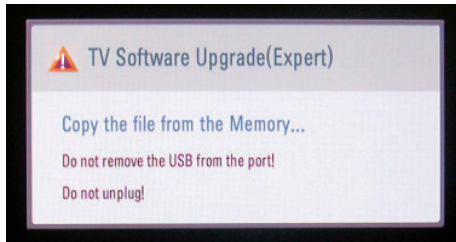
| No. | Item                                                        | Min | Typ  | Max  | Unit | Remark                                                                                                     |
|-----|-------------------------------------------------------------|-----|------|------|------|------------------------------------------------------------------------------------------------------------|
| 1.  | Audio practical max Output, L/R (Distortion=10% max Output) | 9.0 | 10.0 | 12.0 | W    | Measurement condition<br>Auto Volume : Off<br>Audio EQ : Off<br>Clear Voice : Off<br>Virtual Surround: Off |
|     |                                                             | 8.5 | 8.9  | 9.8  | Vrms |                                                                                                            |
| 2.  | Speaker (8 $\Omega$ Impedance)                              |     | 10.0 | 15.0 | W    |                                                                                                            |

Measurement condition:

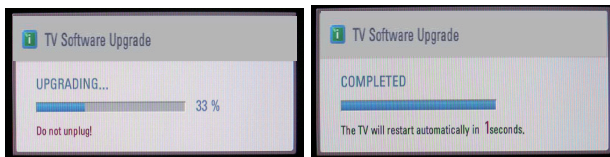
- (1) RF input: Mono, 1 KHz sine wave signal, 100 % Modulation
- (2) CVBS, Component: 1 KHz sine wave signal 0.5 Vrms
- (3) RGB PC: 1 KHz sine wave signal 0.7 Vrms

## 6. USB S/W Download(Service only)

- (1) Put the USB Stick to the USB socket.
- (2) Automatically detecting update file in USB Stick.
  - If your downloaded program version in USB Stick is Low, it didn't work. But your downloaded version is High, USB data is automatically detecting.(Download Version High & Power only mode, Set is automatically Download)
- (3) Show the message "Copying files from memory".



- (4) Updating is starting.

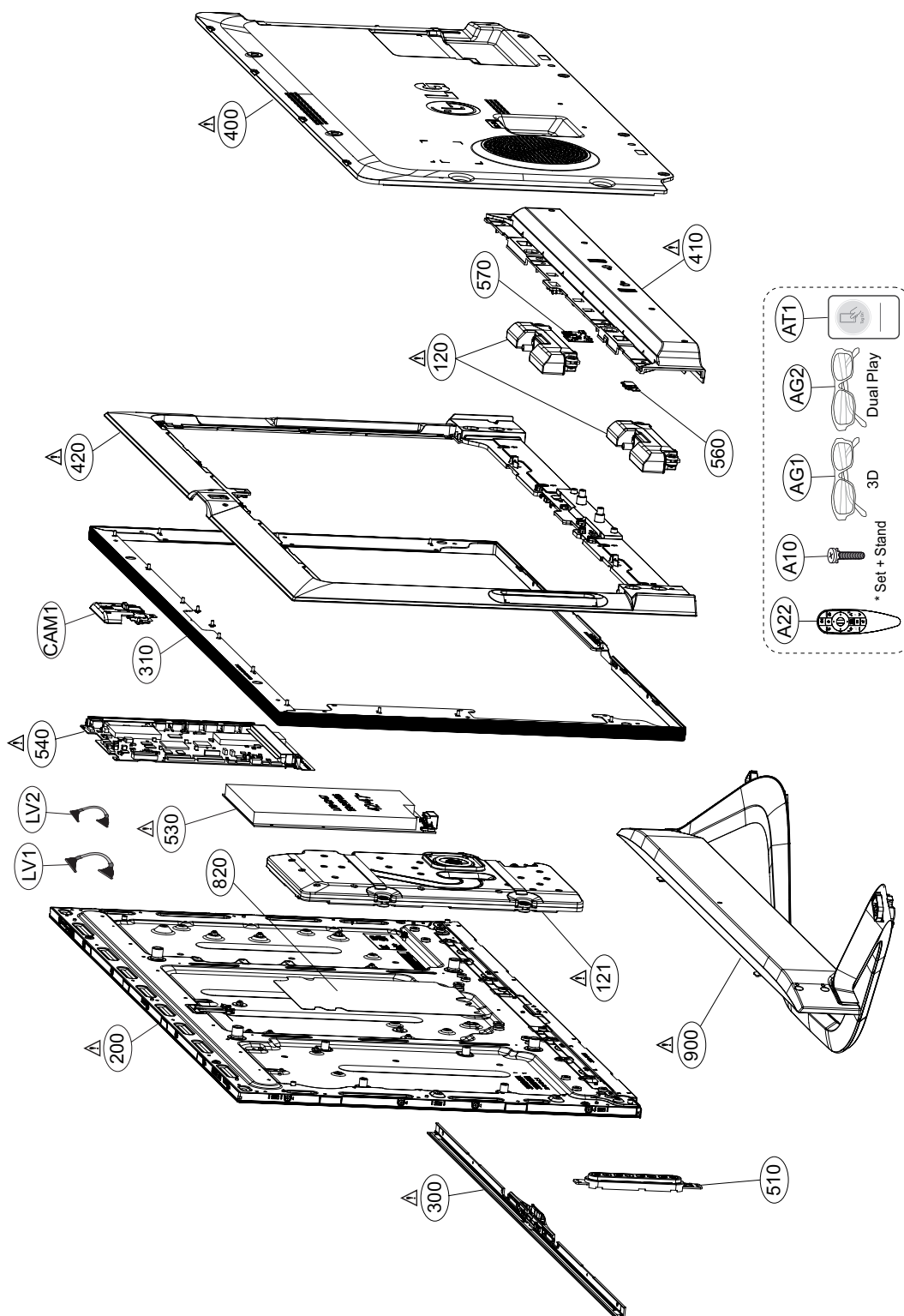


- (5) Updating Completed, The TV will restart automatically.
  - (6) If your TV is turned on, check your updated version and Tool option. (explain the Tool option, next stage)
    - \* If downloading version is more high than your TV have, TV can lost all channel data. In this case, you have to channel recover. if all channel data is cleared, you didn't have a DTV/ ATV test on production line.
- \* After downloading, have to adjust Tool Option again.
- (1) Push "IN-START" key in service remote control.
  - (2) Select "Tool Option 1" and push "OK" key.
  - (3) Punch in the number. (Each model has their number)

# EXPLODED VIEW

## IMPORTANT SAFETY NOTICE

Many electrical and mechanical parts in this chassis have special safety-related characteristics. These parts are identified by  $\Delta$  in the Schematic Diagram and EXPLODED VIEW. It is essential that these special safety parts should be replaced with the same components as recommended in this manual to prevent X-RADIATION, Shock, Fire, or other Hazards. Do not modify the original design without permission of manufacturer.



### Clock for LG1154D

MAIN Clock(24MHz)

10pF

C100

GND

XIN\_MAIN

24MHz

X1 X2

10pF

C101

GND

XOUT

XO\_MAIN

System Clock for Analog block(24MHz)

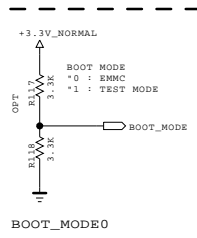
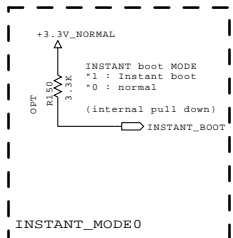
[illegible]

Write Protection  
 - Low : Normal Operation  
 - High : Write Protection



```

graph LR
    GND --- R101[R101] --- Node
    Node --- R100[R100] --- OPT
    Node --- R33_0[33] --- PLLSET0
    Node --- R33_1[33] --- PLLSET1
    OPT --- R33_0
    OPT --- R33_1
  
```



TP101 ● —————> TRST\_N0

TP102 ● —————> TDIO

TP103 ● —————> TDO0

TP104 ● —————> TMS0

TP105 ● —————> TCK0

TP106 ● —————> SOC\_RESET

+3.3V\_NORM

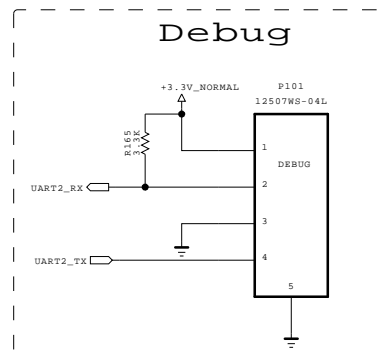
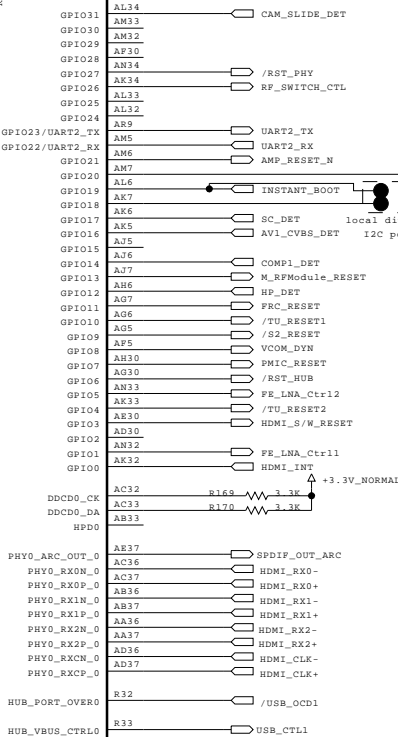
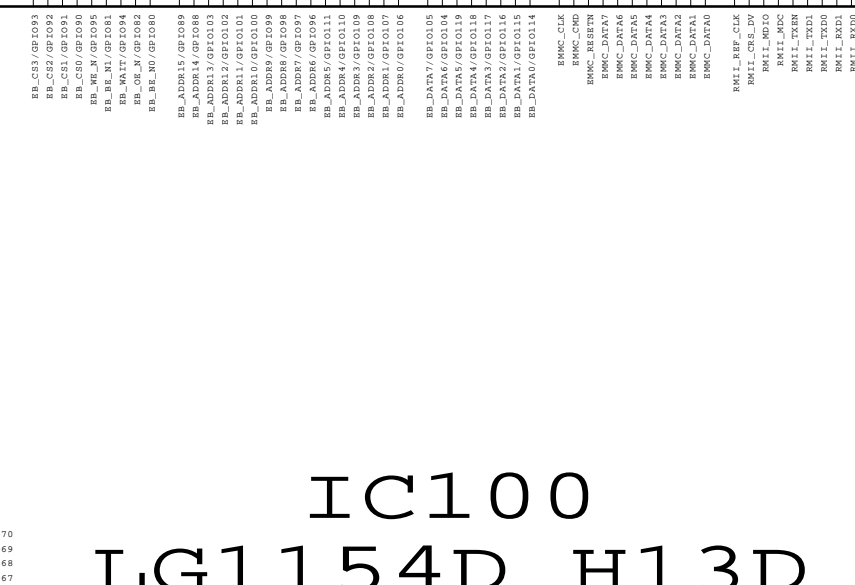
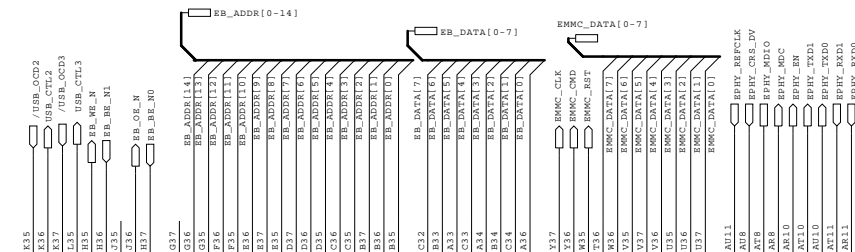
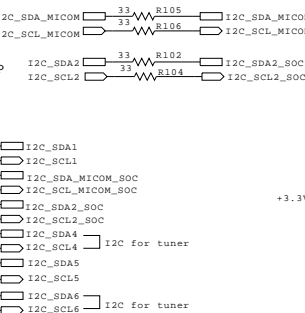
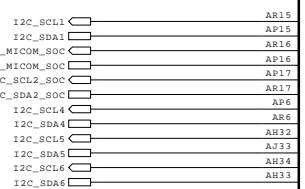
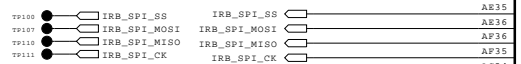
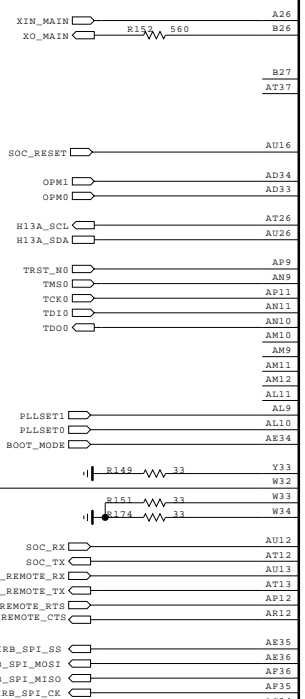
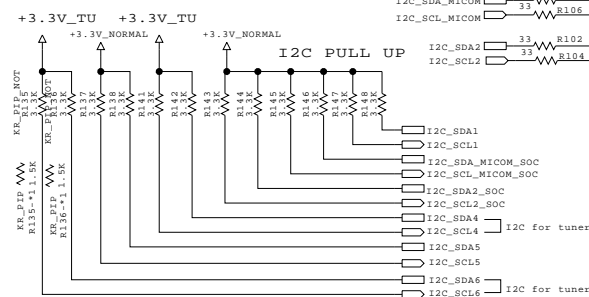
TP108 ● —————> C106

TP109 ● —————> GND

C106  
33pF  
50V

[illegible]

|              |          | HIGH       | LOW          |
|--------------|----------|------------|--------------|
| MODEL_OPT_0  | Area1    | Taiwan     | non Taiwan   |
| MODEL_OPT_1  | FRC      | FRC(120Hz) | No FRC(60Hz) |
| MODEL_OPT_2  | Panel1   | FHD        | UD           |
| MODEL_OPT_3  | OLED     | OLED       | NOW OLED     |
| MODEL_OPT_4  | Module   | V13        | V12          |
| MODEL_OPT_5  | Reserved |            | Default      |
| MODEL_OPT_6  | CP BOX   | Enable     | Disable      |
| MODEL_OPT_7  | T2 Tuner | Support    | Not Support  |
| MODEL_OPT_8  | S Tuner  | Support    | Not Support  |
| MODEL_OPT_9  | Area2    | AJ_3A      | non AJ_3A    |
| MODEL_OPT_10 | EP1      | Support    | Not Support  |



|       |            |       |            |
|-------|------------|-------|------------|
| MODEL |            | DATE  | 2012-11-14 |
| BLOCK | H13 D CHIP | SHEET | /          |

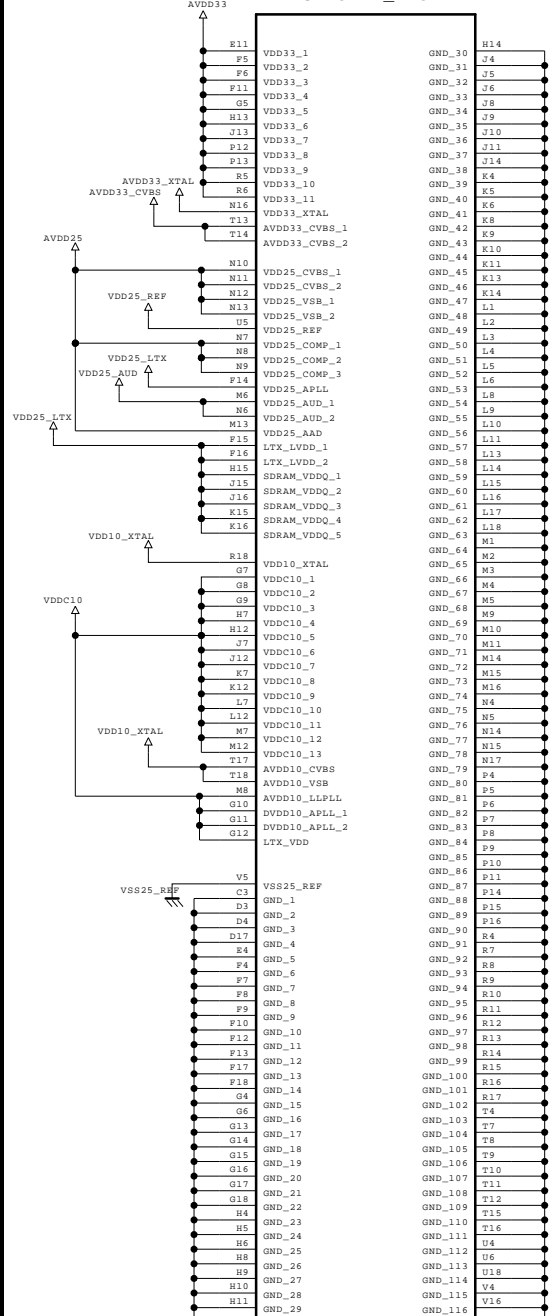
SECRET  
G Electronics



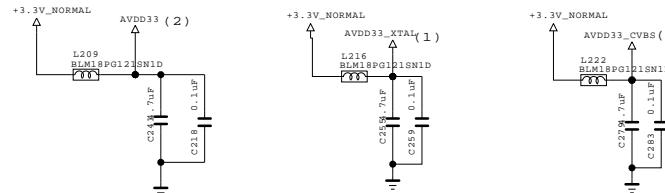
## LG1154A

## H13A\_NON\_BRAZIL

IC101  
LG1154AN\_H13A

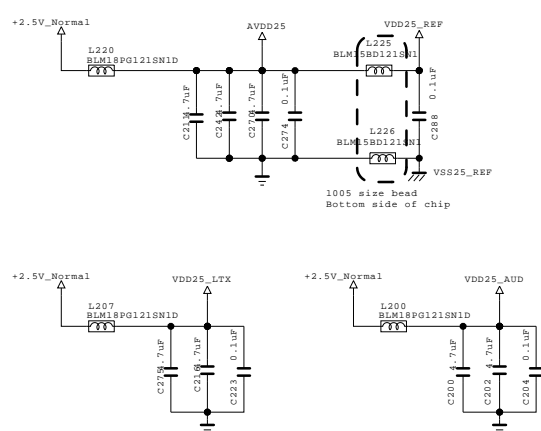


## +3.3V\_Bypass Cap

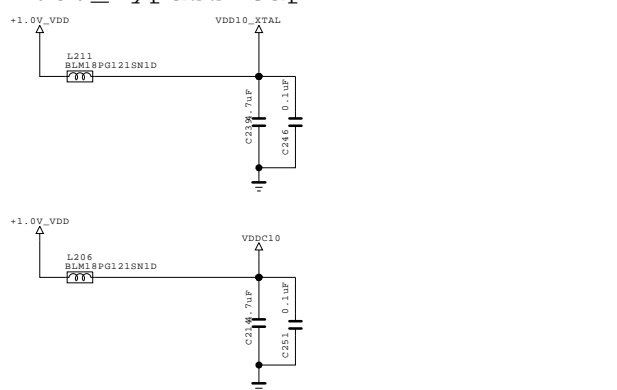


## +2.5V\_Bypass\_Cap

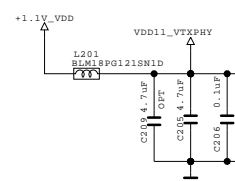
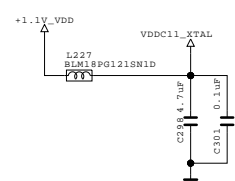
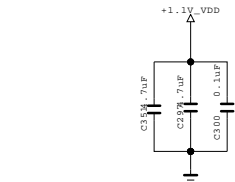
AFE 3CH Power



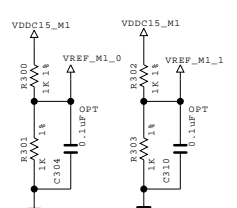
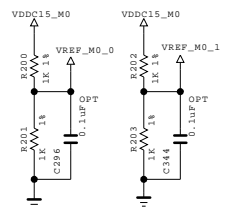
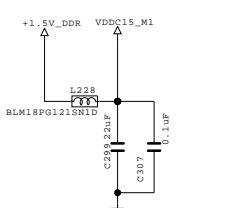
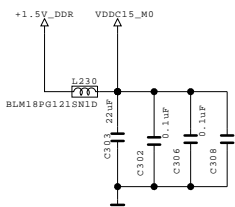
## +1.0V\_Bypass Cap



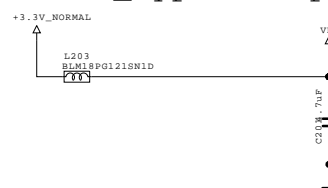
## +1.1V\_Bypass Cap



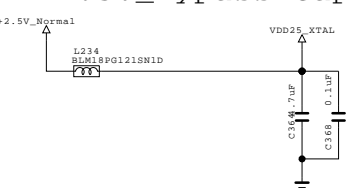
## +1.5V\_Bypass Cap



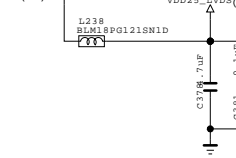
## +3.3V\_Bypass Cap



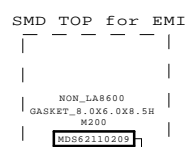
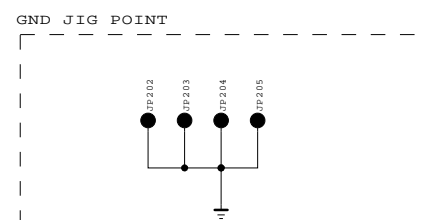
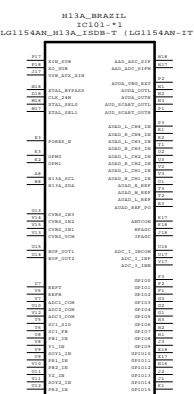
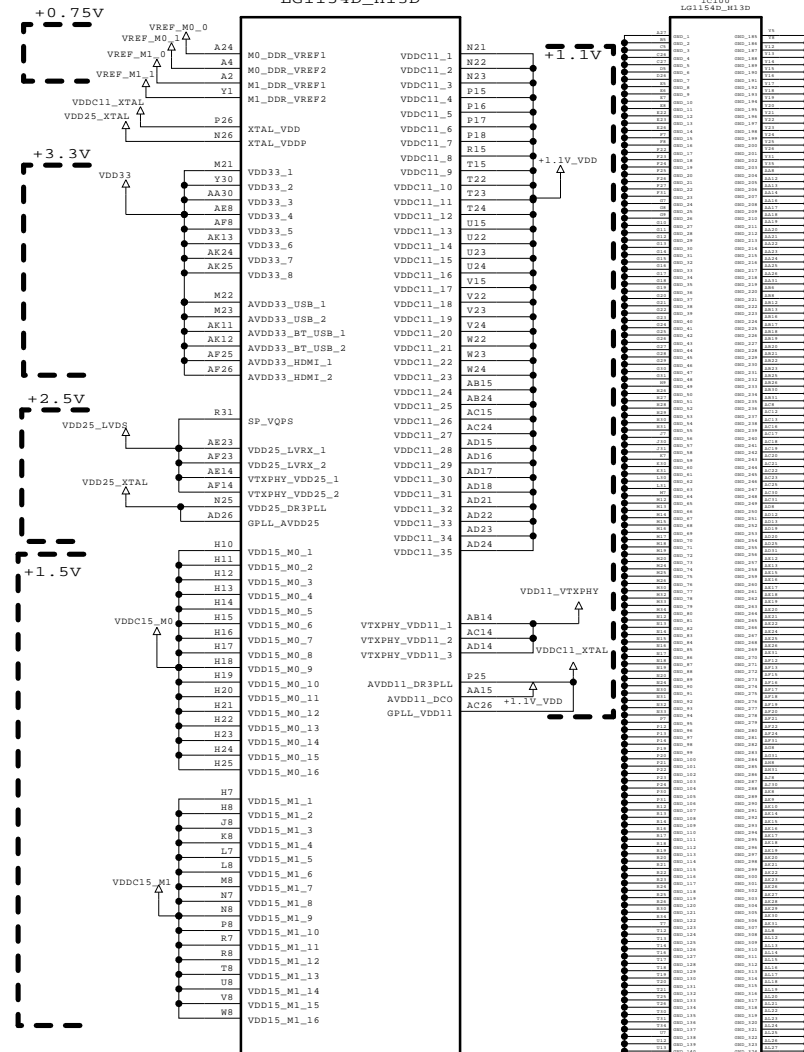
## +2.5V Bypass Cap



```
+2.5V_Normal
(1) 4
```



IC100  
LG1154D H13D



THE ⚠ SYMBOL MARK OF THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FIRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFACTURES SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE ⚠ SYMBOL MARK OF THE SCHEMATIC.

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BSD-NC4\_H002-HD

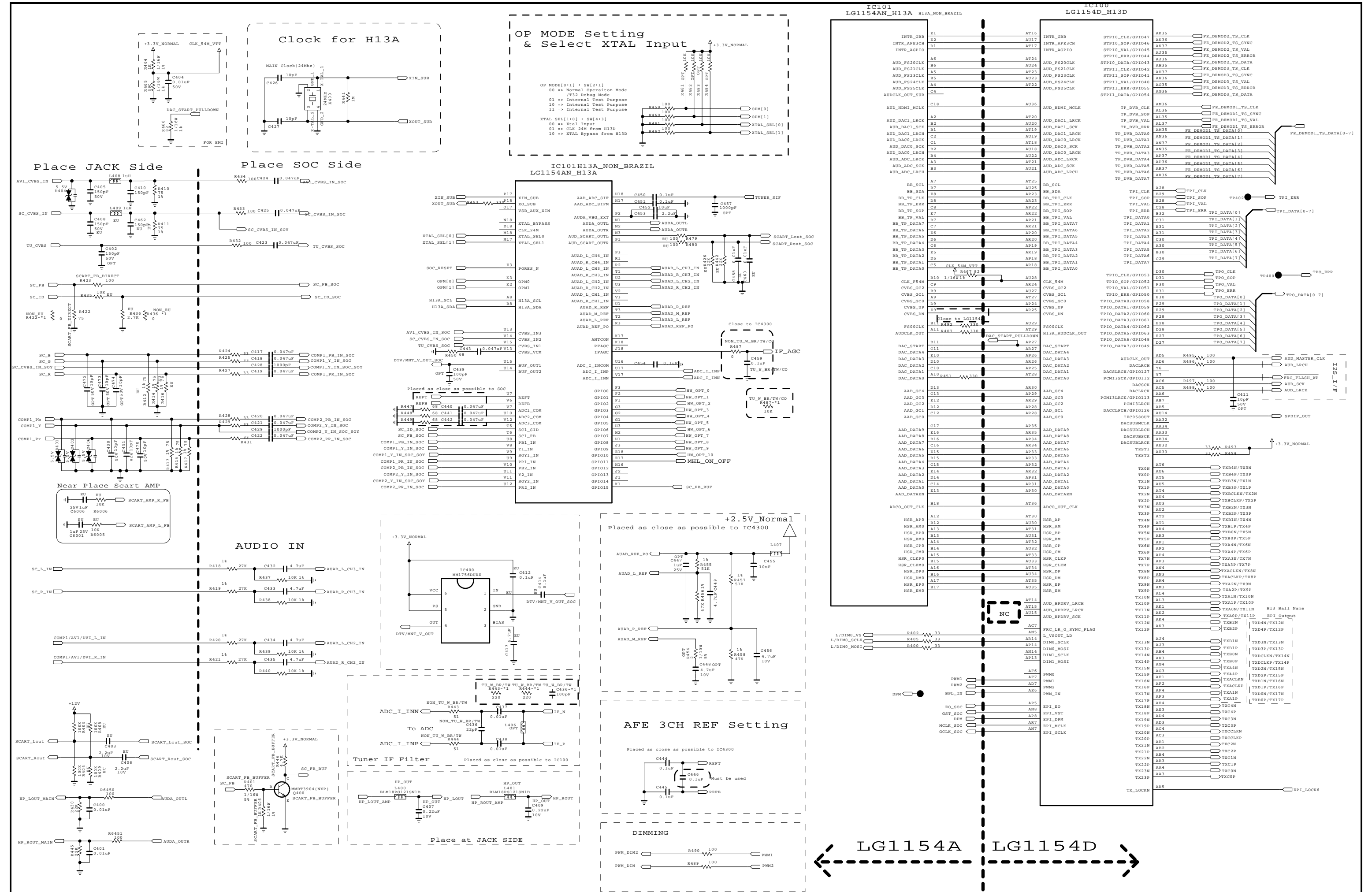
MODEL



ВЛ ПГК

DATE \_\_\_\_\_

54FF

2012-12-24



THE  SYMBOL MARK OF THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFACTURES SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE  SYMBOL MARK OF THE SCHEMATIC.

SECRET  
LGElectronics

LG ELECTRONICS

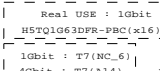
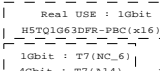
MODEL  
BLOCK

MAIN AUDIO/VIDEO

DATE  
SHEET

2012-11-13

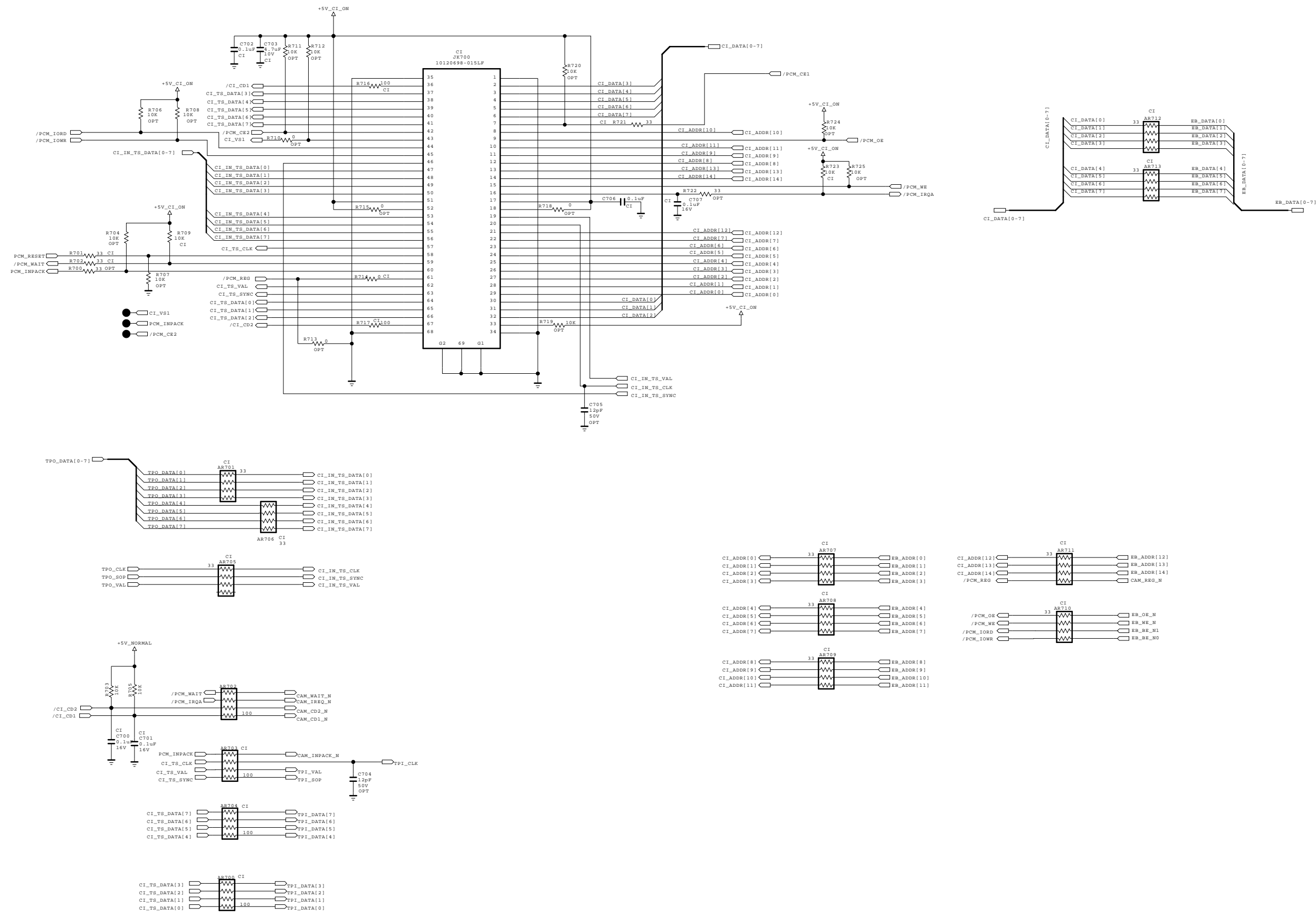
BSD-NC4\_H004-HD





SECRET  
LGElectronics



|       |          |       |            |
|-------|----------|-------|------------|
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| BLOCK | MAIN DDR | SHEET | /          |



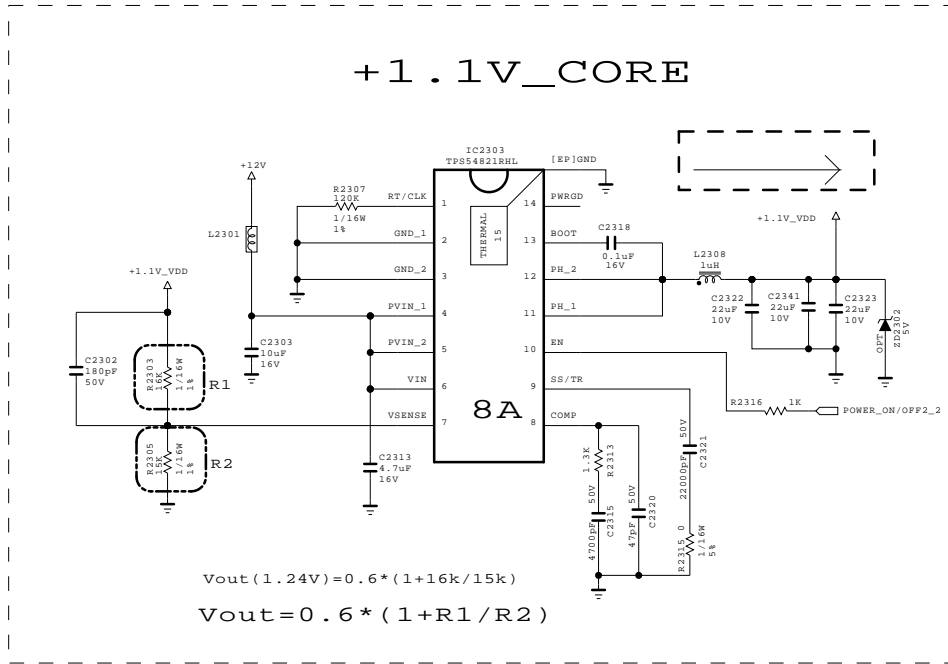
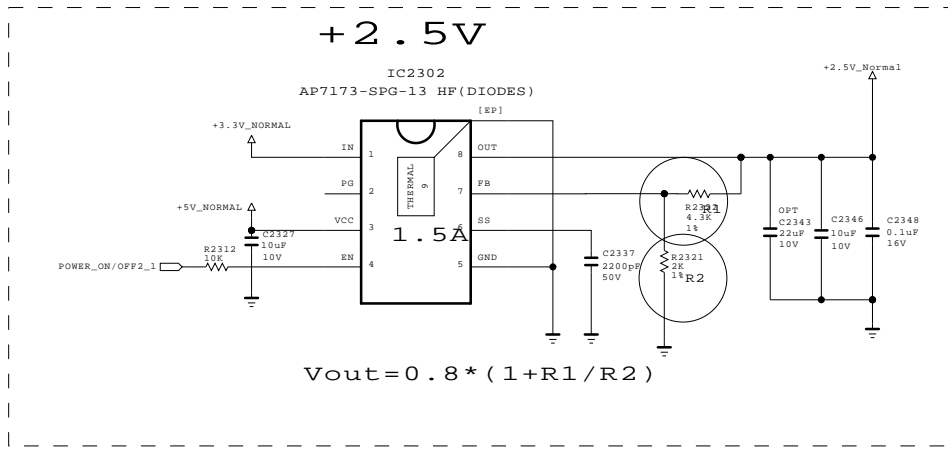
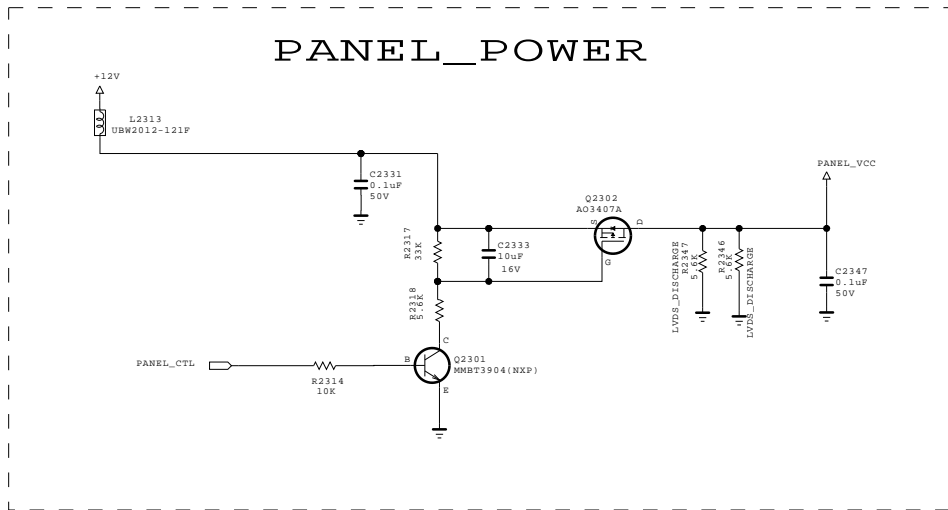
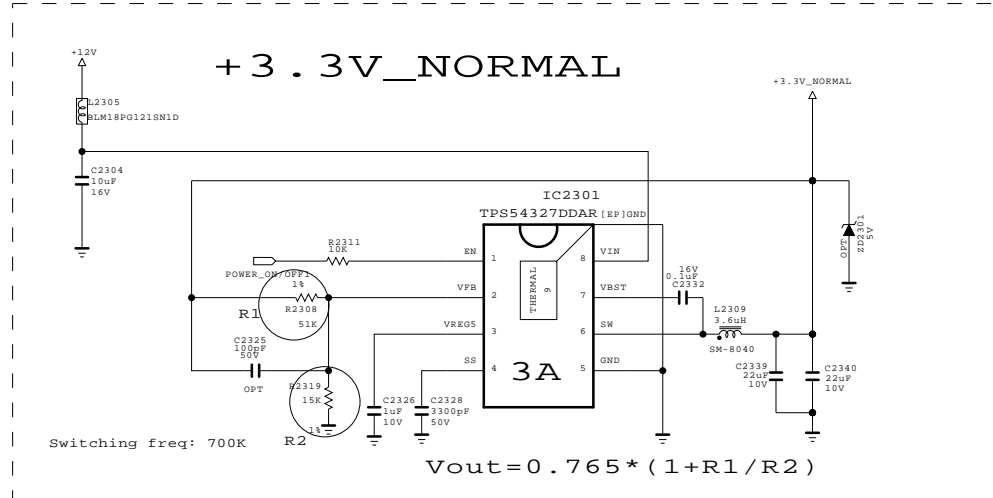
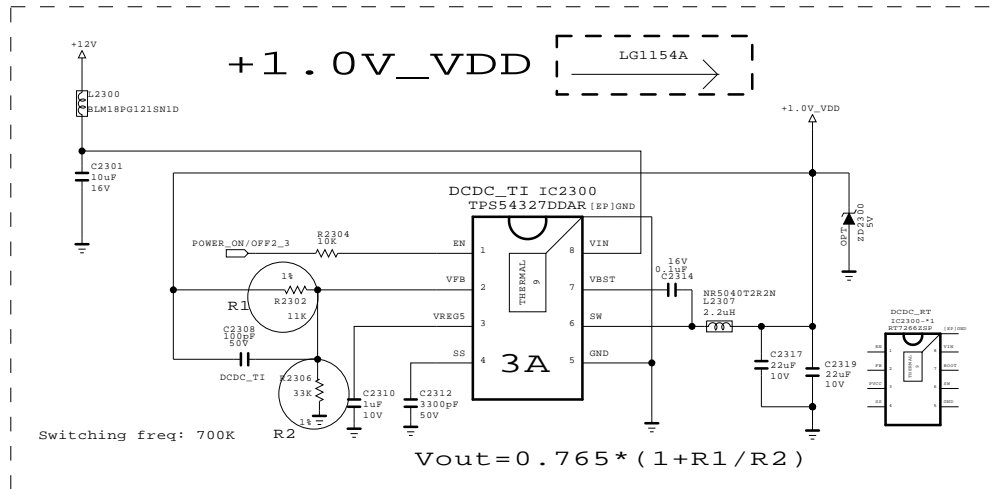
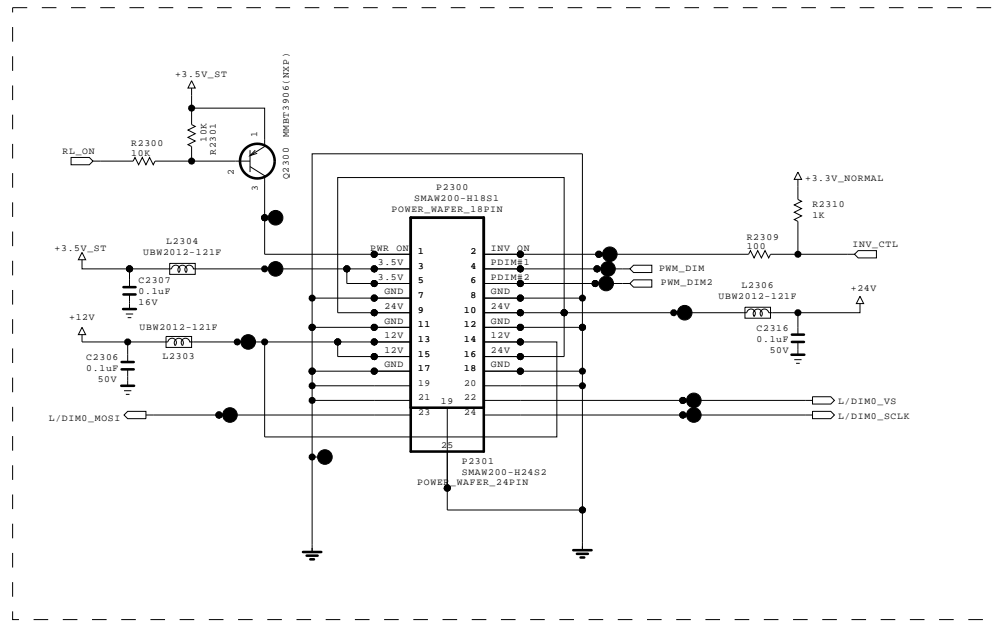
THE  SYMBOL MARK OF THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFACTURES SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE  SYMBOL MARK OF THE SCHEMATIC.

SECRET  
LGElectronics



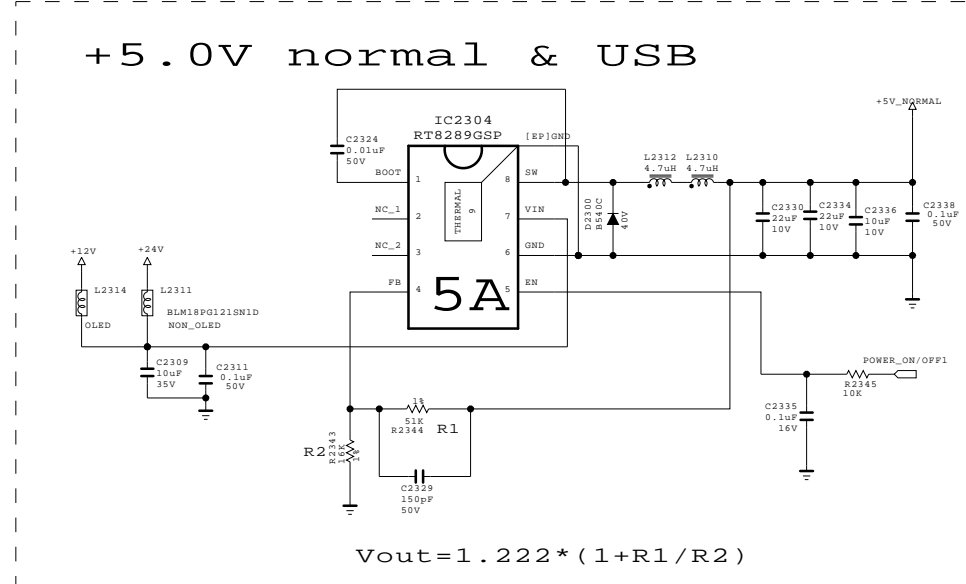
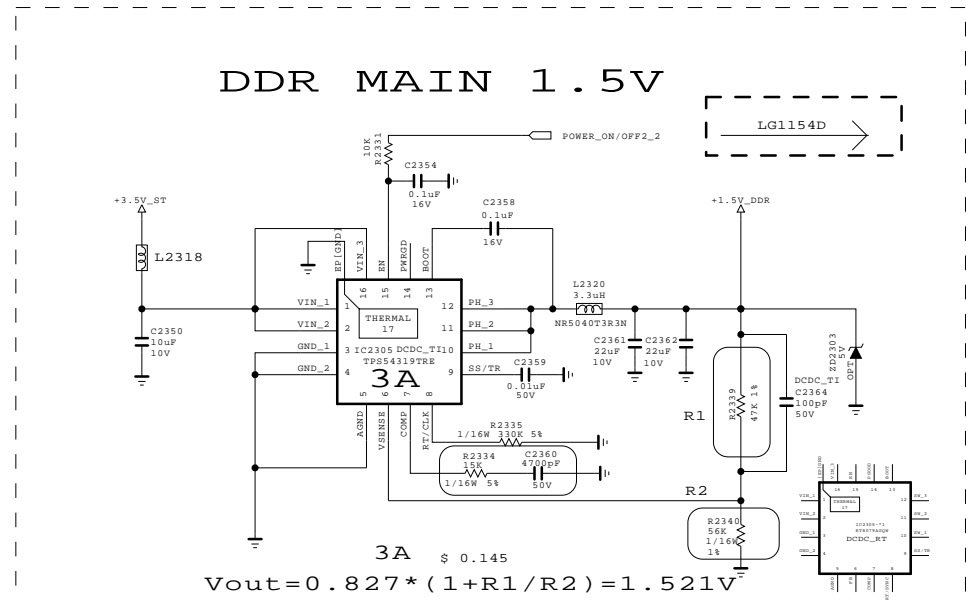
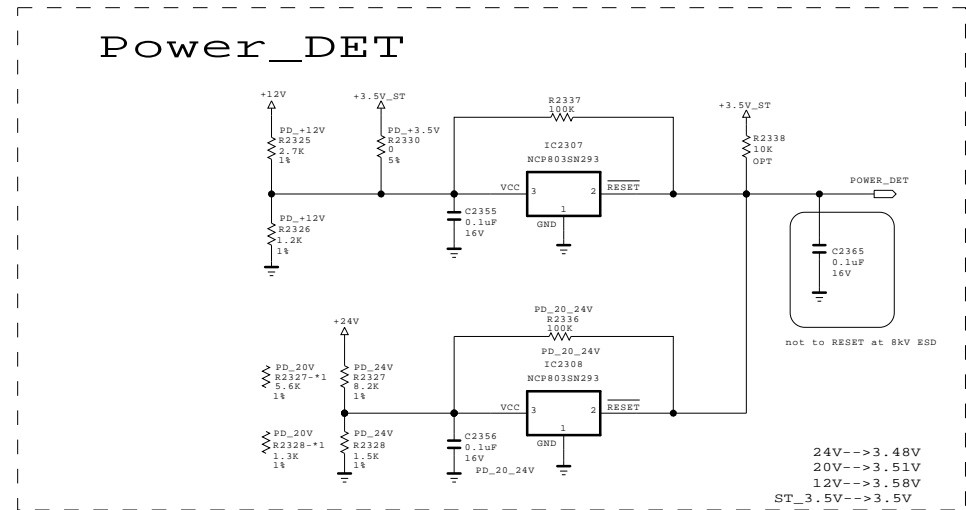
|       |         |       |            |
|-------|---------|-------|------------|
| MODEL |         | DATE  | 2012-10-20 |
| BLOCK | PCMCI A | SHEET | /          |





#### POWER UP SEQUENCE

5V/3.3V->2.5V->1.5V/1.1V->1.0V  
 LG1154D : 3.3V->2.5V->1.5V->1.1V  
 LG1154AN : 3.3V->2.5V->1.0V



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SECRET  
 LGElectronics

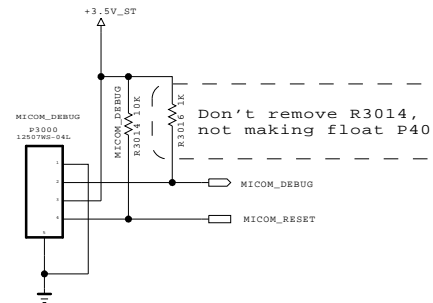
LG ELECTRONICS

|       |        |       |            |
|-------|--------|-------|------------|
| MODEL | LG1154 | DATE  | 2012-12-07 |
| BLOCK | POWER  | SHEET | /          |

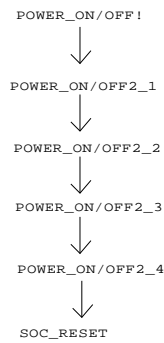
BSD-NC4\_H023-HD

## Renesas MICOM

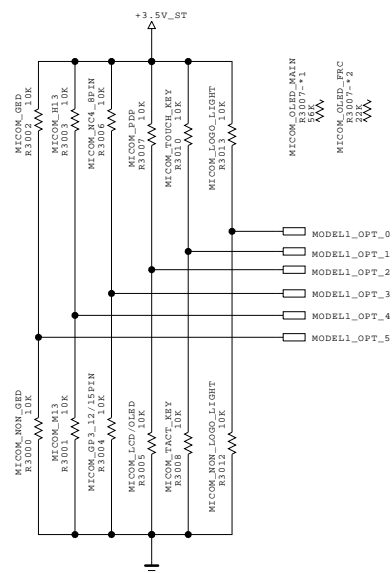
## For Debug



## GP4 High/MID Power SEQUENCE

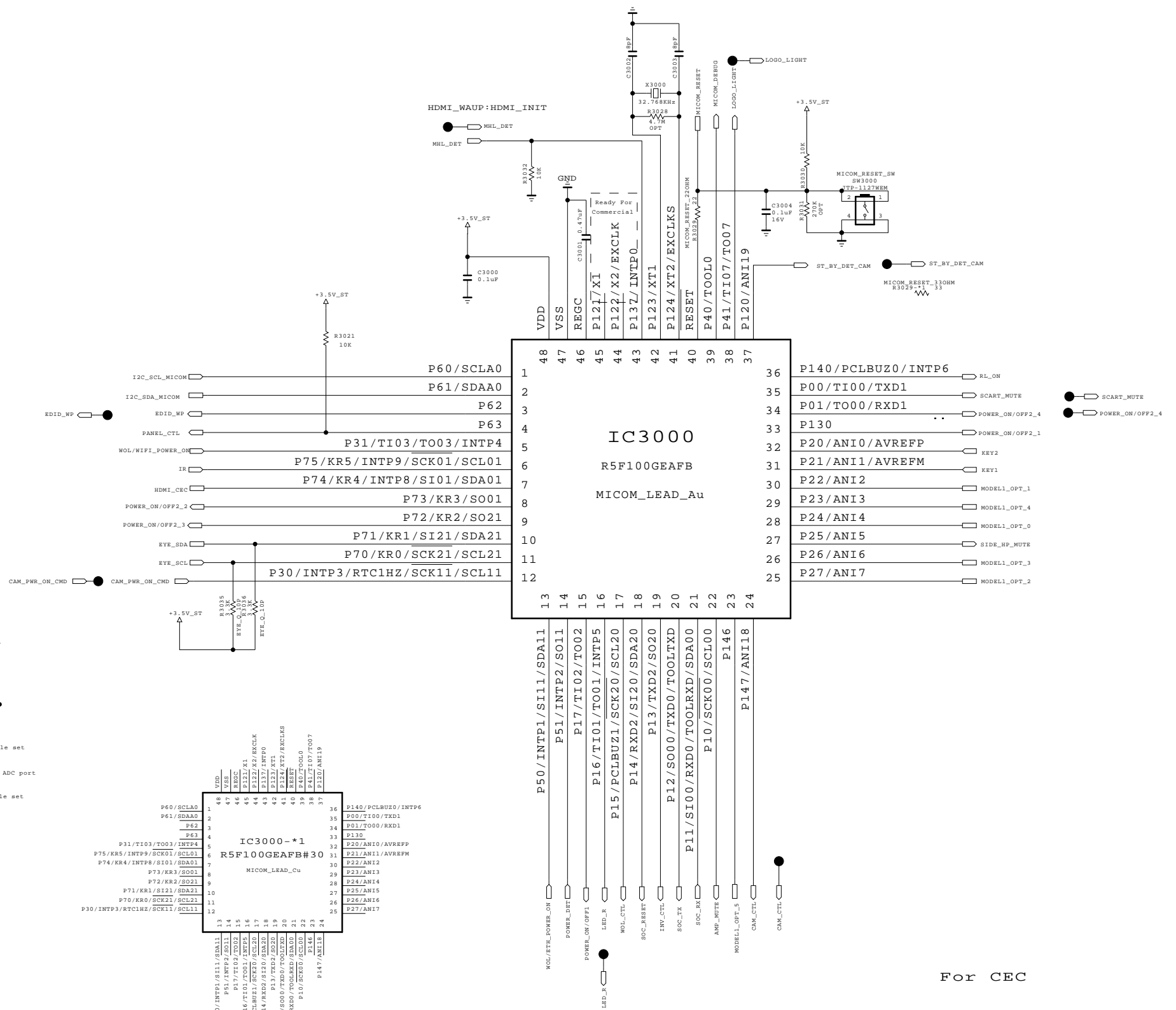


## MICOM MODEL OPTION

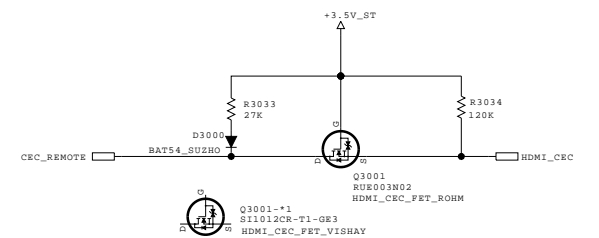


MICOM MODEL OPTION

|             | 0               | 1               |                         |
|-------------|-----------------|-----------------|-------------------------|
| MODEL_OPT_0 | NON LOGO        | LOGO            | For LOGO LIGHT          |
| MODEL_OPT_1 | TACT_KEY        | TOUCH_KEY       | Ready for sample set    |
| MODEL_OPT_2 | LCD / OLED      | PDP             | Need to Assign ADC port |
| MODEL_OPT_3 | IR_wafer(12/15) | IR_wafer(10pin) | Ready for sample set    |
| MODEL_OPT_4 | M13             | H13             |                         |
| MODEL_OPT_5 | NON_GED         | GED             |                         |
|             |                 |                 |                         |



For CEC

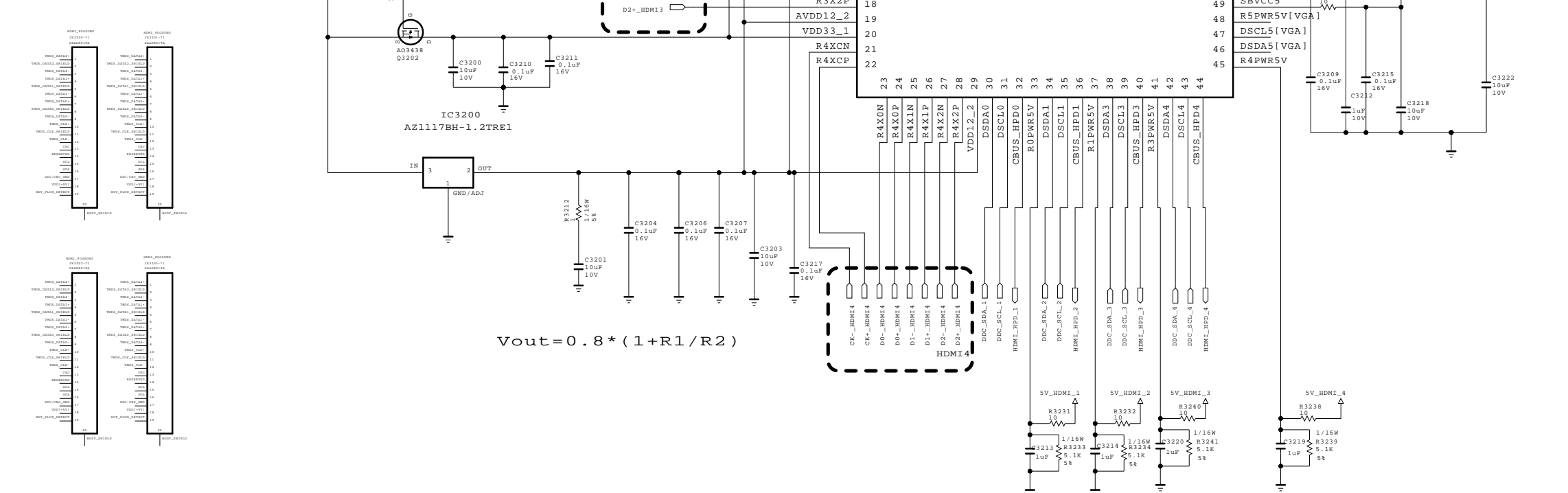
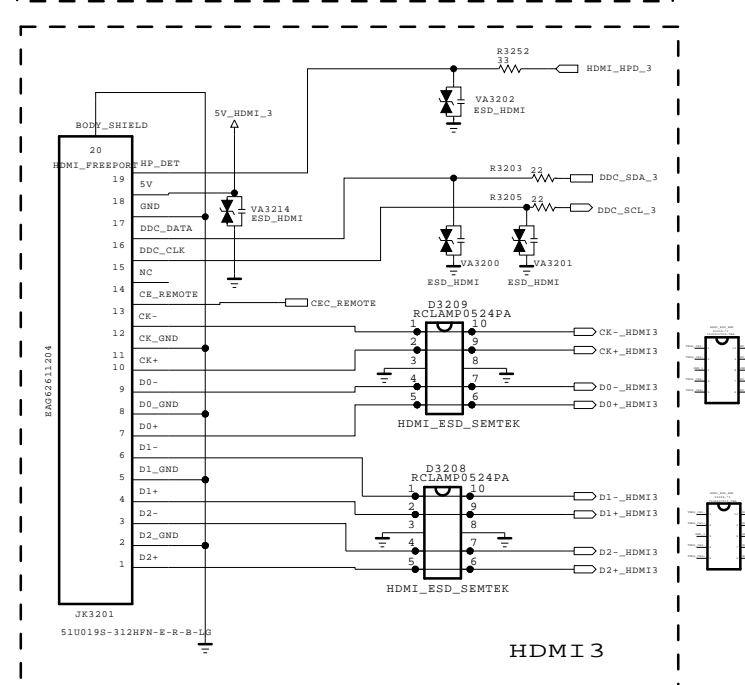
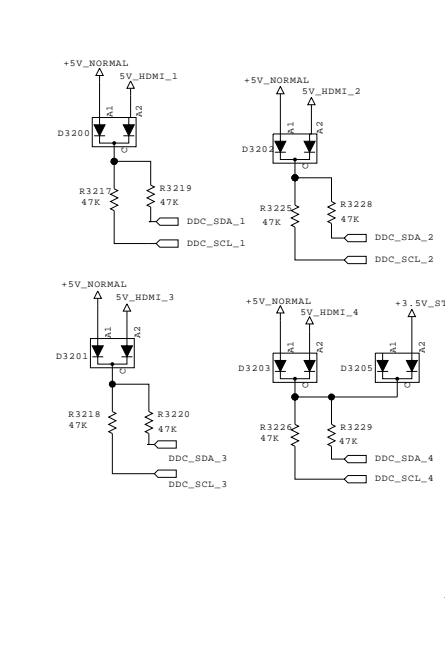
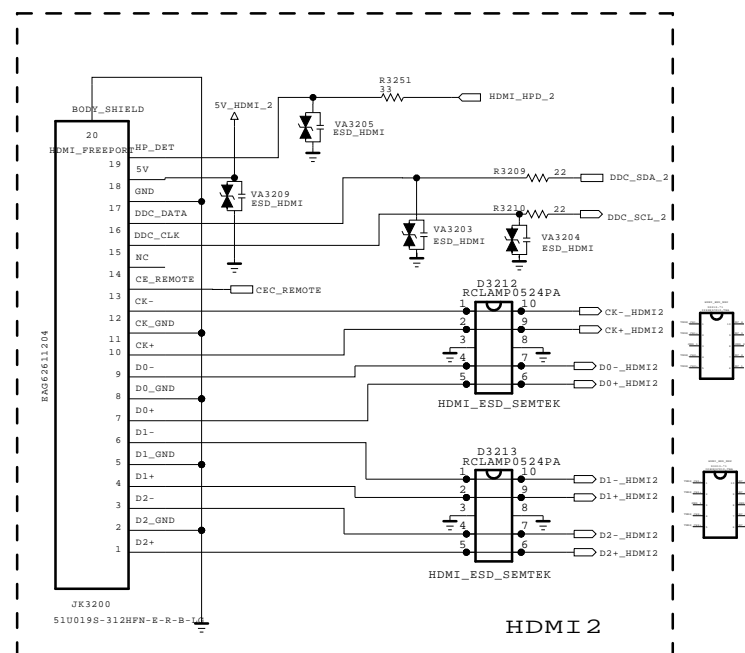
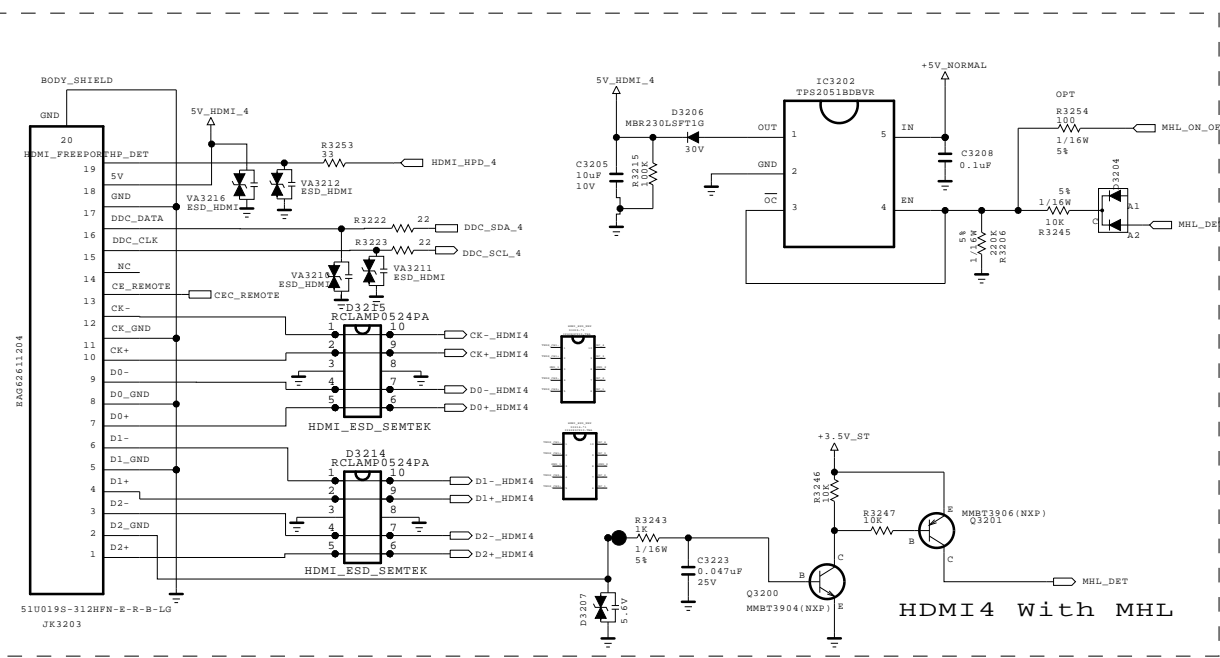
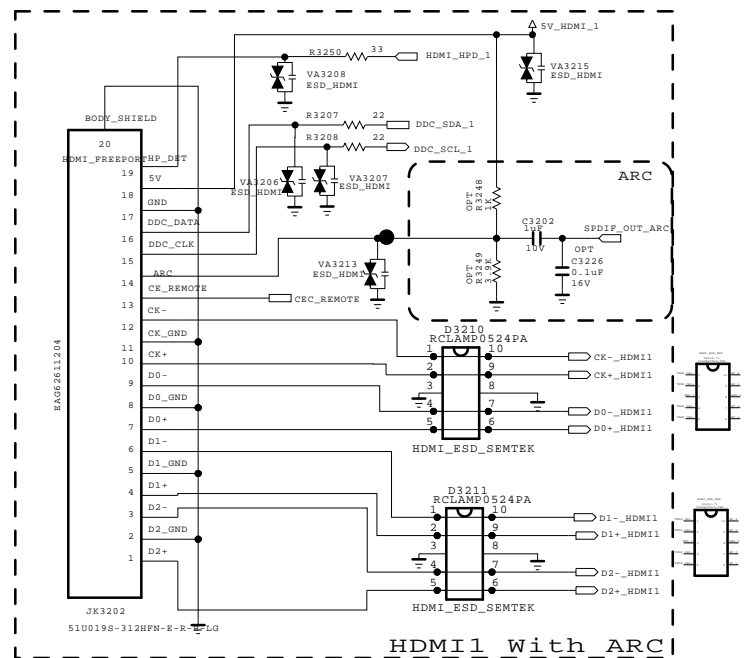




THE ⚠ SYMBOL MARK OF THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FIRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFACTURES SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE ⚠ SYMBOL MARK OF THE SCHEMATIC.

SECRET  
G Electronics



|       |       |       |            |
|-------|-------|-------|------------|
| MODEL |       | DATE  | 2012.02.22 |
| BLOCK | MICOM | SHEET | 30 /       |

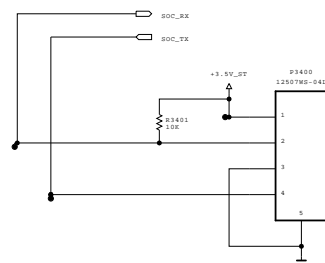
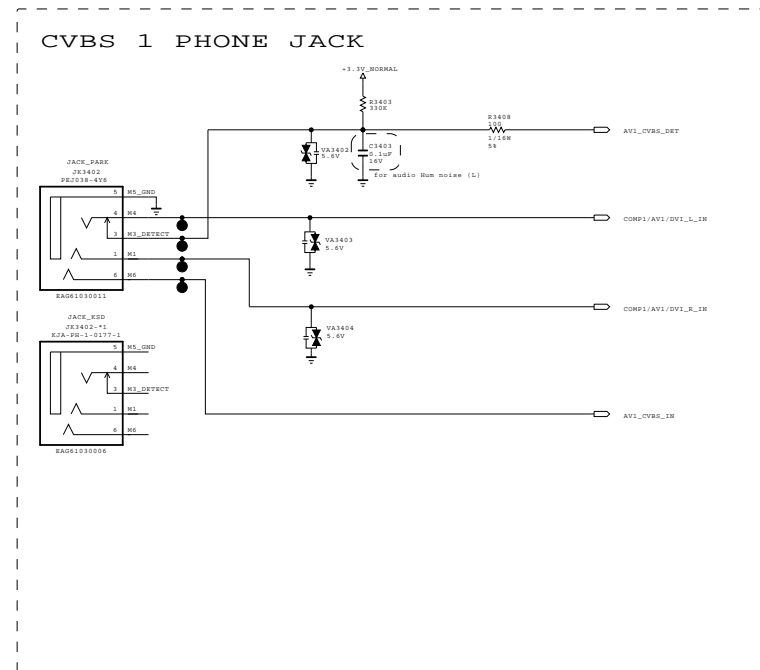
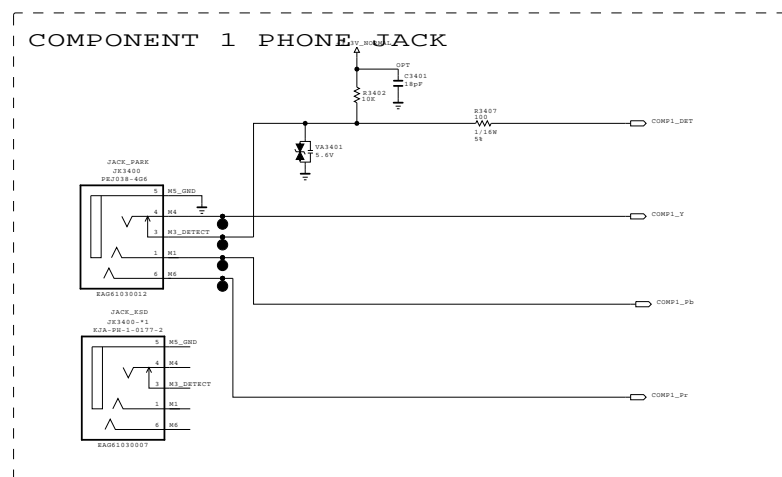
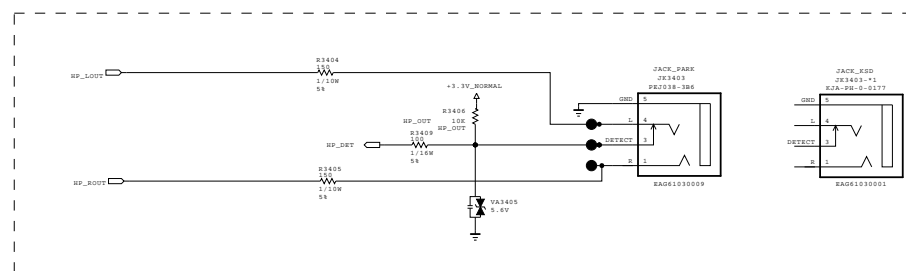
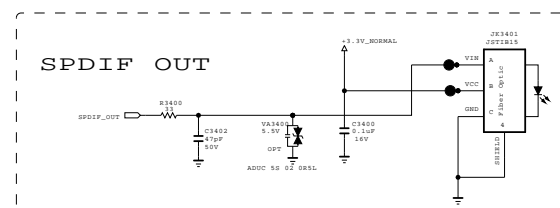




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SECRET  
LGElectronics



|       |      |       |      |
|-------|------|-------|------|
| MODEL | GP 4 | DATE  |      |
| BLOCK | HDMI | SHEET | 32 / |



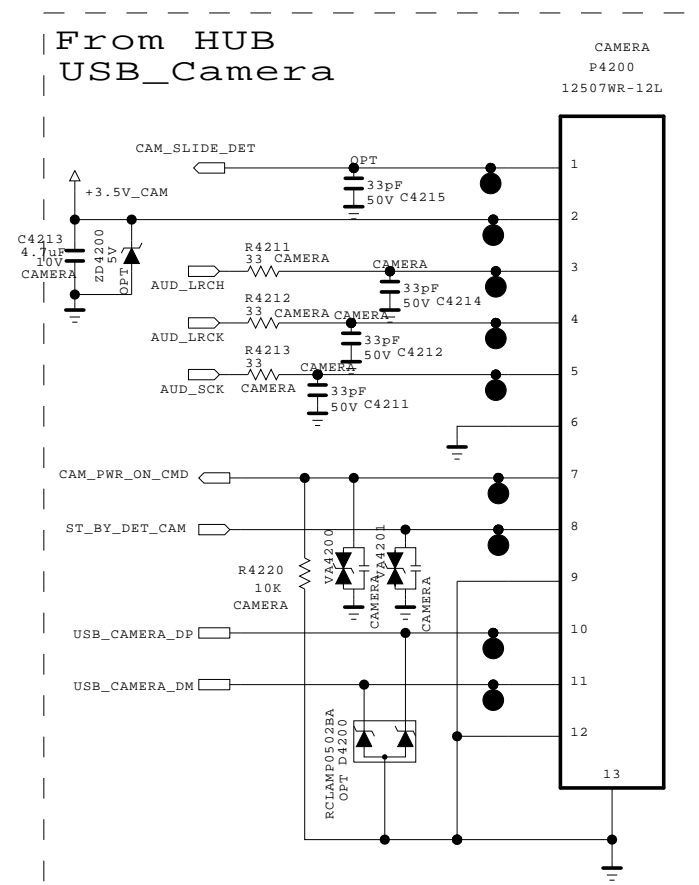
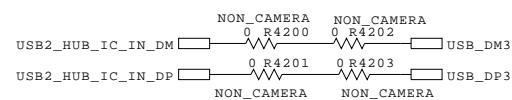
THE  SYMBOL MARK OF THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FIRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFACTURES SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE  SYMBOL MARK OF THE SCHEMATIC.

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|                 |               |       |            |
|-----------------|---------------|-------|------------|
| BSD-NC4_H034-HD |               |       |            |
| MODEL           | JACK HIGH/MID | DATE  | 2012.10.09 |
| BLOCK           |               | SHEET | /          |

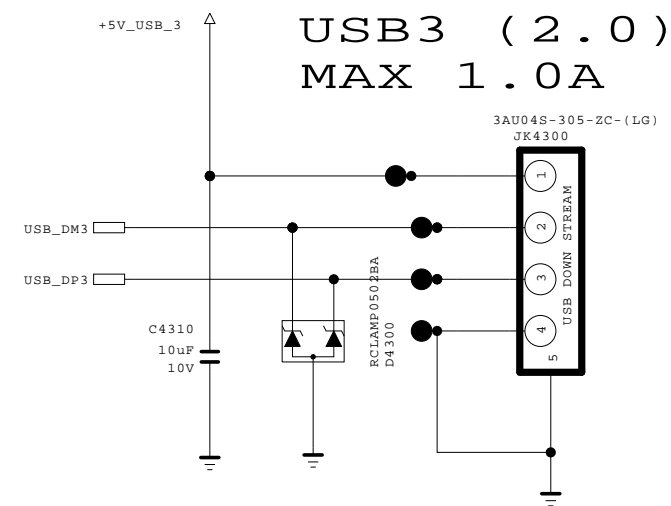
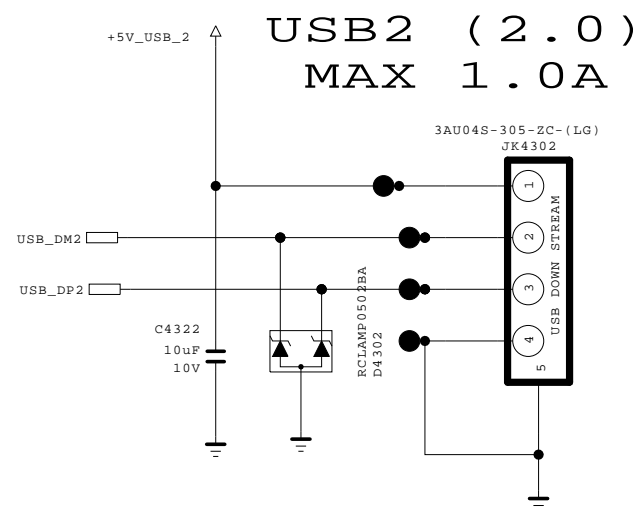
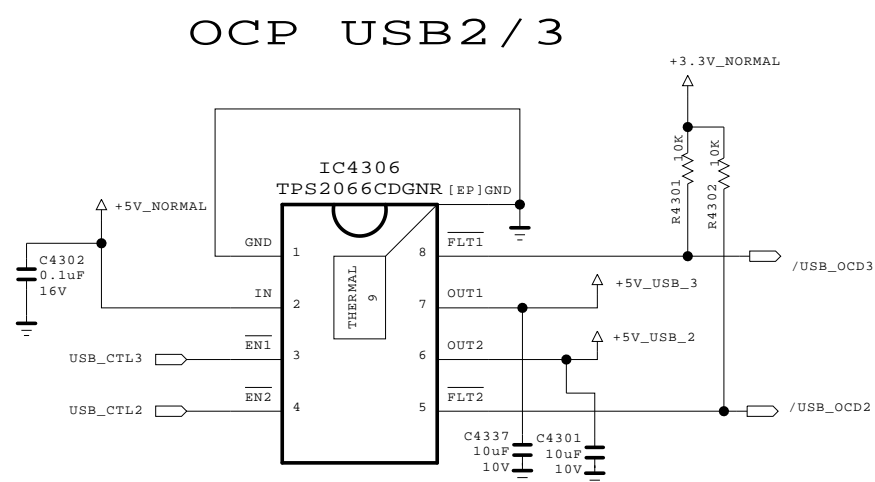
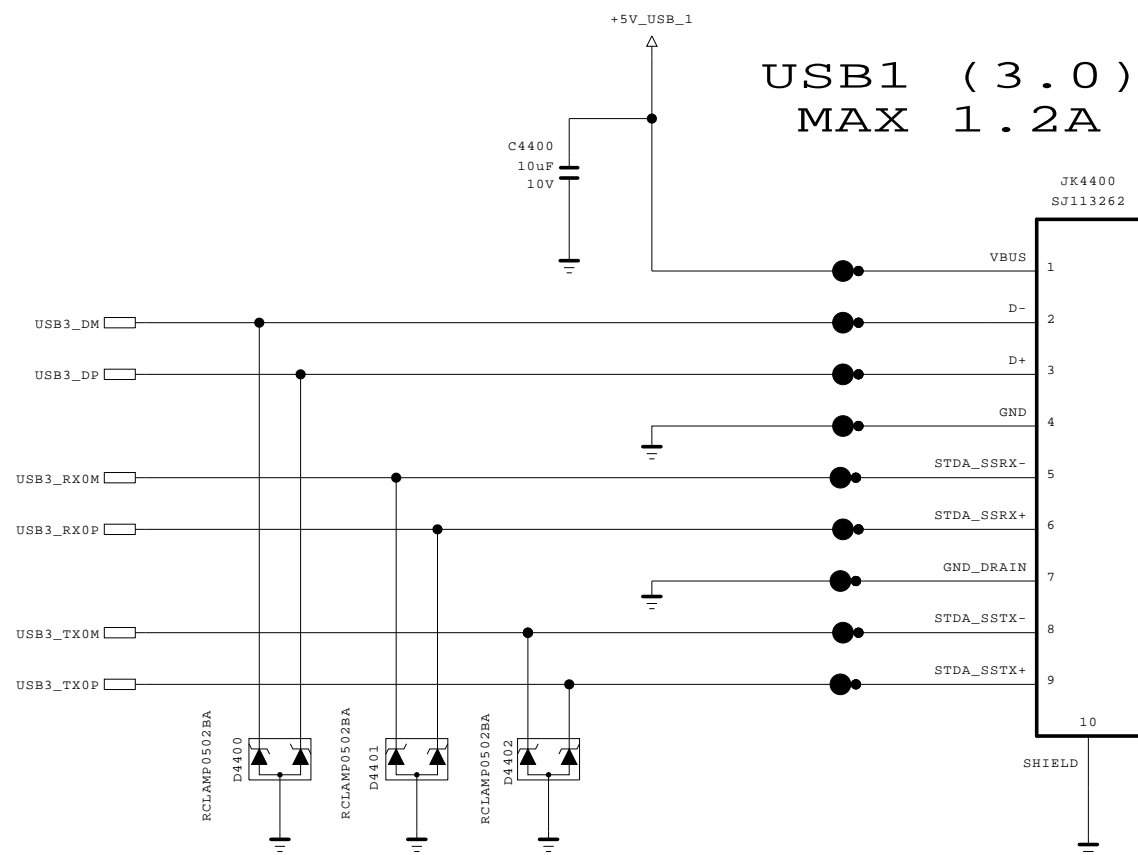
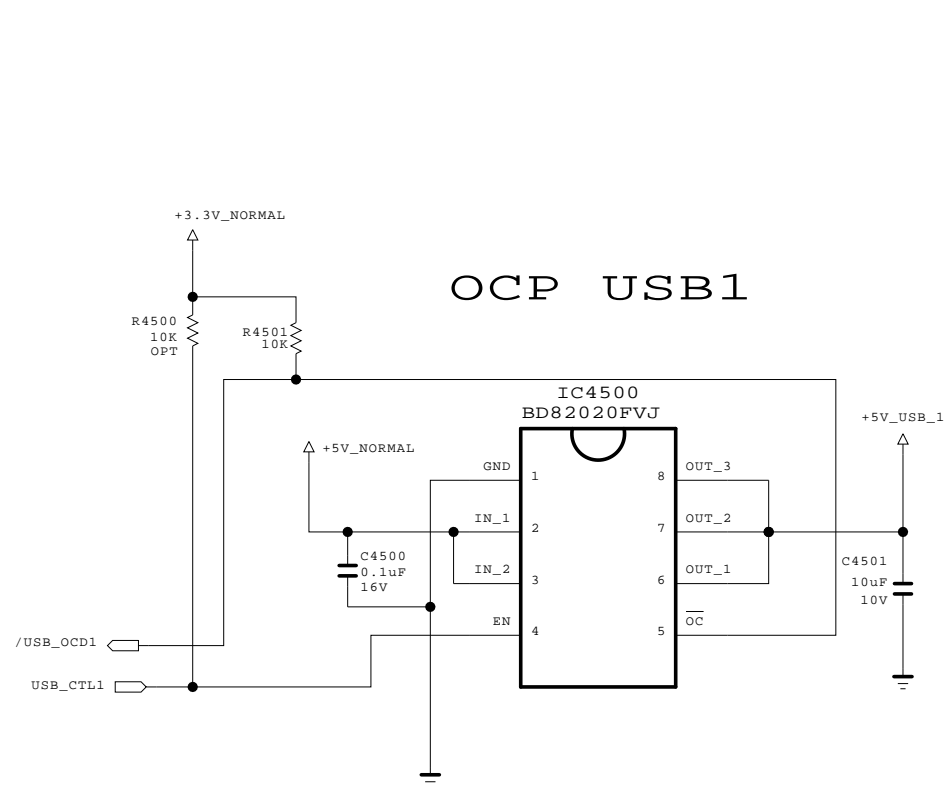






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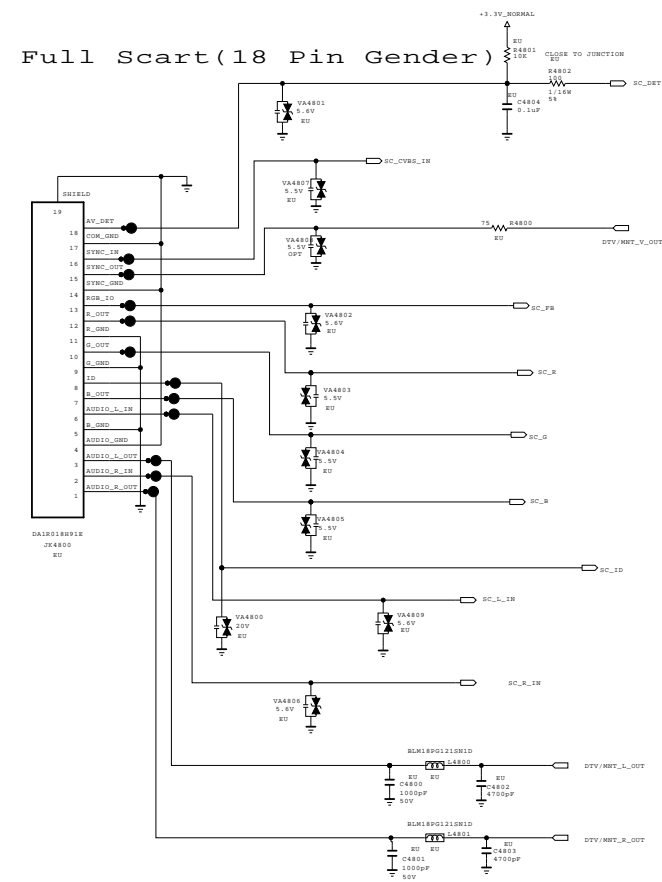
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|-------|----------|-------|------------|
| MODEL | USB3_HUB | DATE  | 2012.10.08 |
| BLOCK |          | SHEET | /          |





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|               |                                                                                                      |
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| SECRET        |  LG ELECTRONICS |
| LGElectronics |                                                                                                      |

|                 |          |       |            |
|-----------------|----------|-------|------------|
| BSD-NC4_H044-HD |          |       |            |
| MODEL           |          | DATE  | 2012-11-09 |
| BLOCK           | USB JACK | SHEET | /          |



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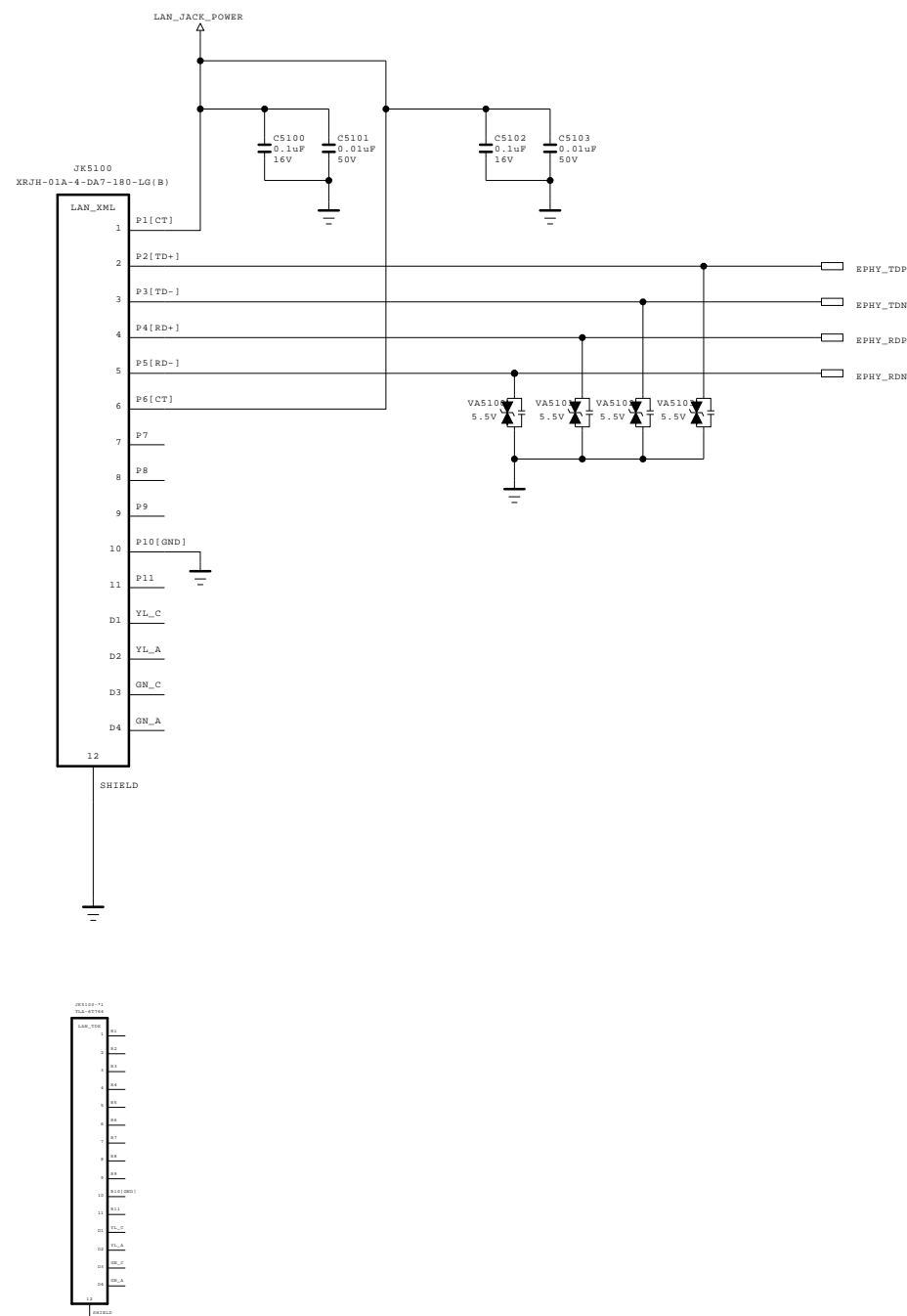
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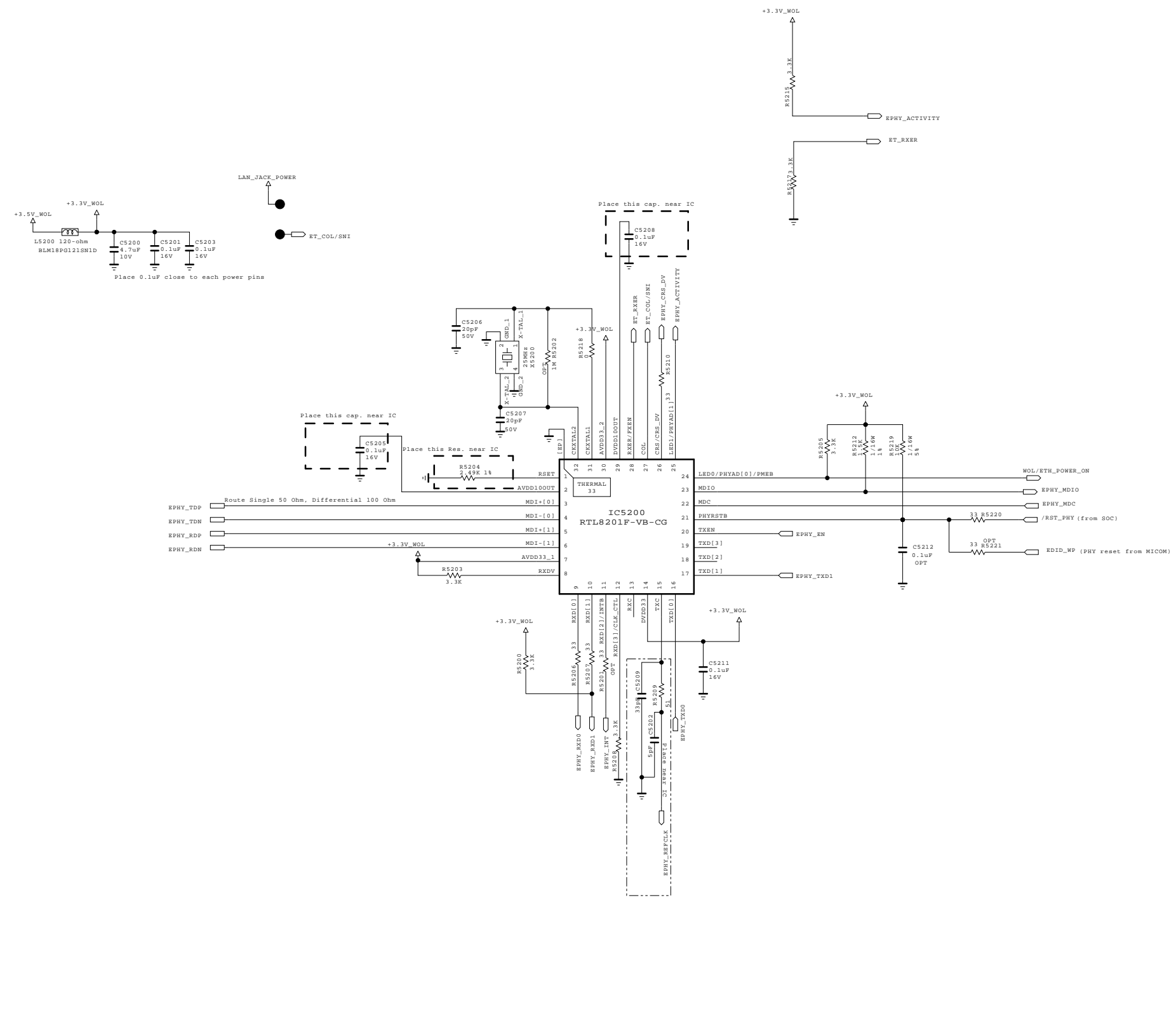
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|       |              |       |            |
|-------|--------------|-------|------------|
| MODEL | LAN_VERTICAL | DATE  | 2011.12.09 |
| BLOCK |              | SHEET | 50 /       |

# Ethernet Block



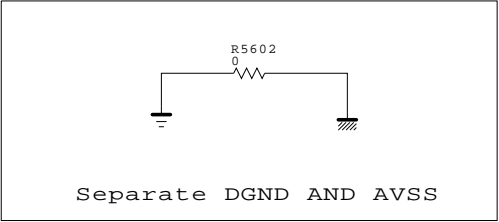
THE ⚠ SYMBOL MARK OF THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFACTURES SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE ⚠ SYMBOL MARK OF THE SCHEMATIC.

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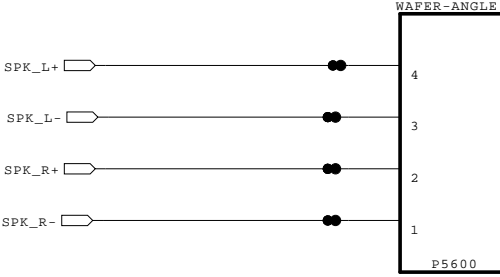
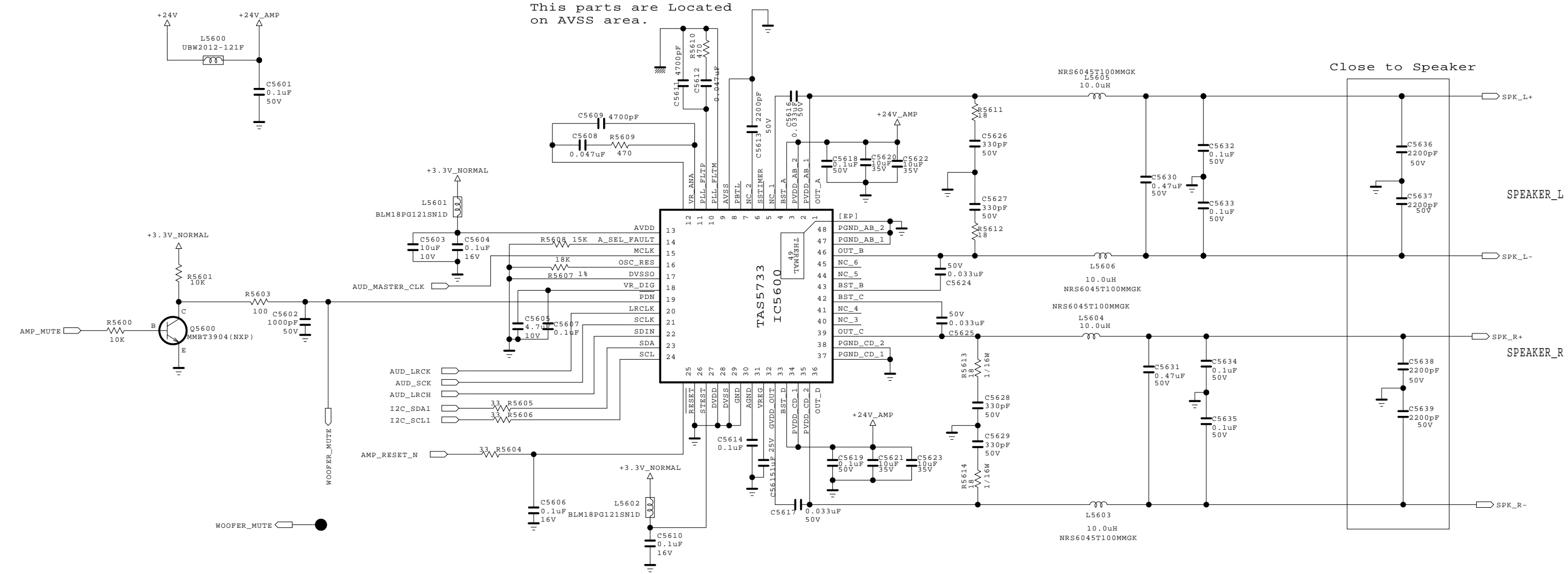


BSD-NC4\_H052-HD

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|-------|----------|-------|------------|
| MODEL |          | DATE  | 2012-09-12 |
| BLOCK | ETHERNET | SHEET | /          |



This parts are Located on AVSS area.



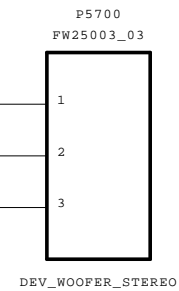
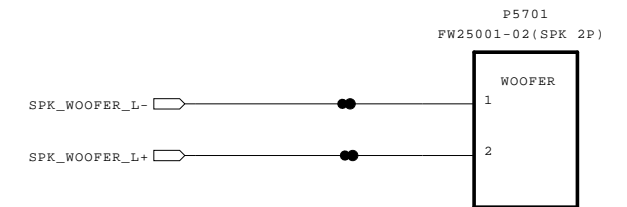
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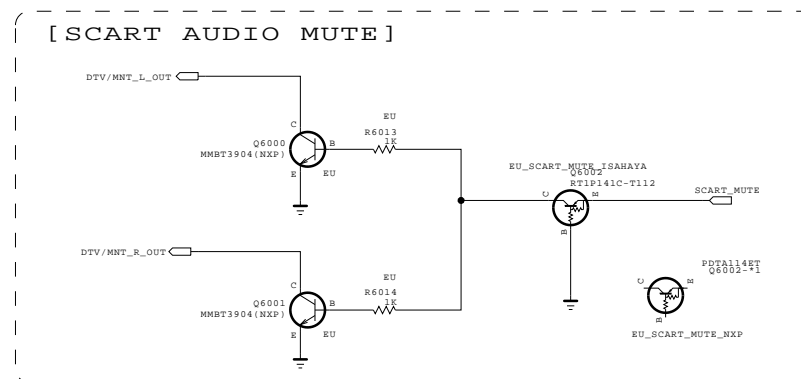
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|       |            |       |            |
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| BLOCK | AUDIO[ST]  | SHEET | 58 /       |



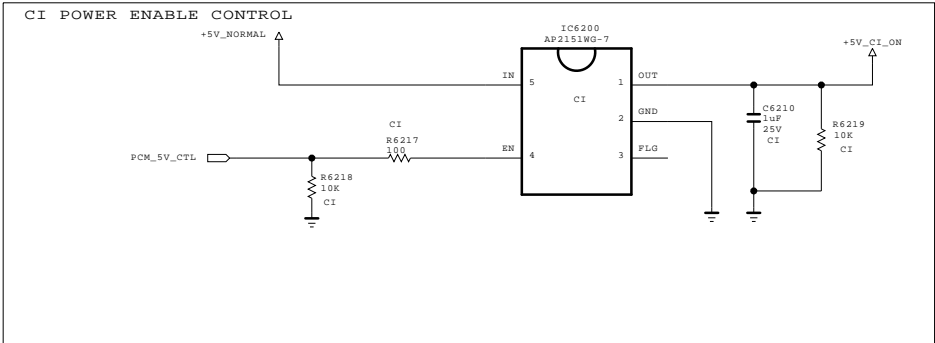
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| SECRET         |  LG ELECTRONICS |
| LG Electronics |                                                                                                      |



LGE Internal Use Only



|       |                 |       |            |
|-------|-----------------|-------|------------|
| MODEL | SCART AUDIO AMP | DATE  | 2011.11.21 |
| BLOCK |                 | SHEET | 60 /       |





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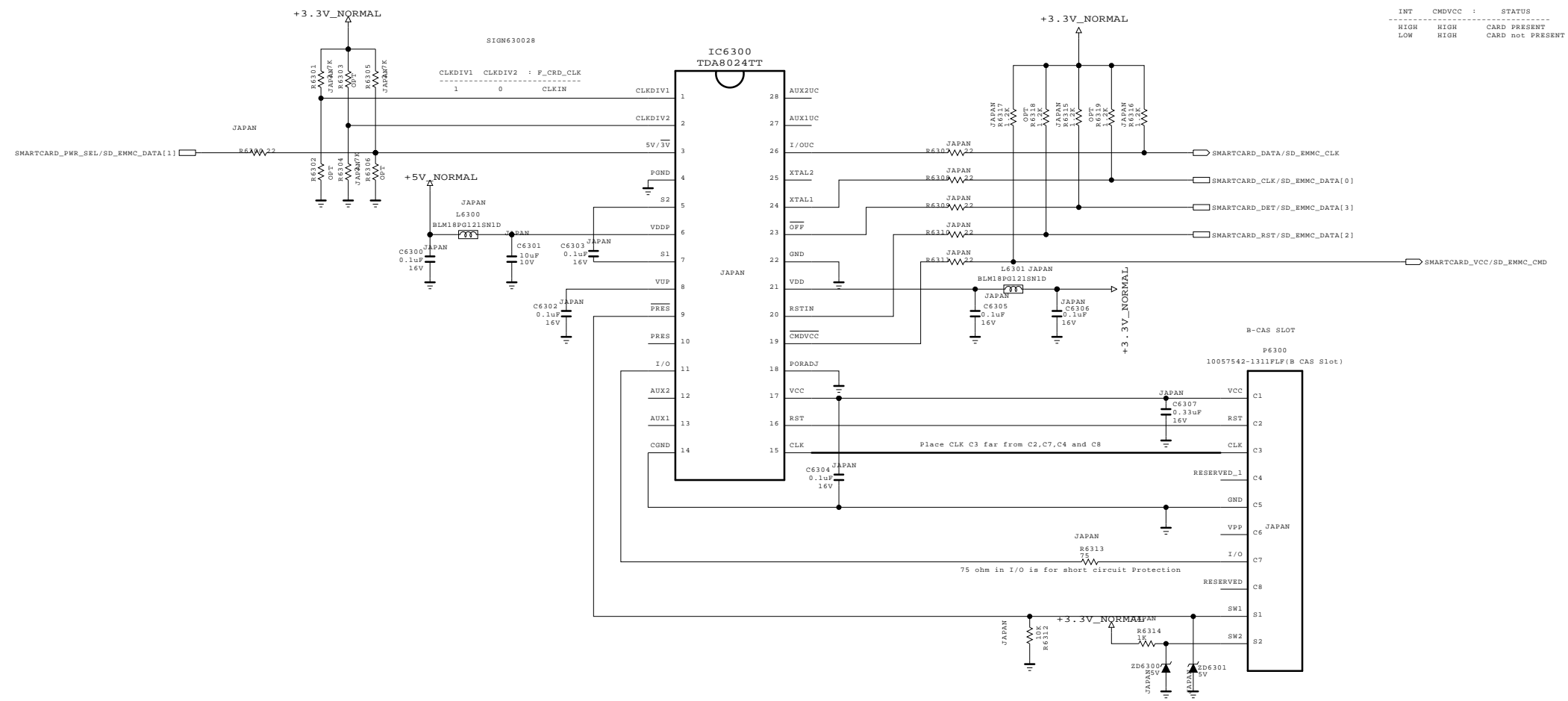
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|       |         |       |            |
|-------|---------|-------|------------|
| MODEL | CI SLOT | DATE  | 2011.10.31 |
| BLOCK |         | SHEET | 62 /       |

B-CAS (SMART CARD) INTERFACE



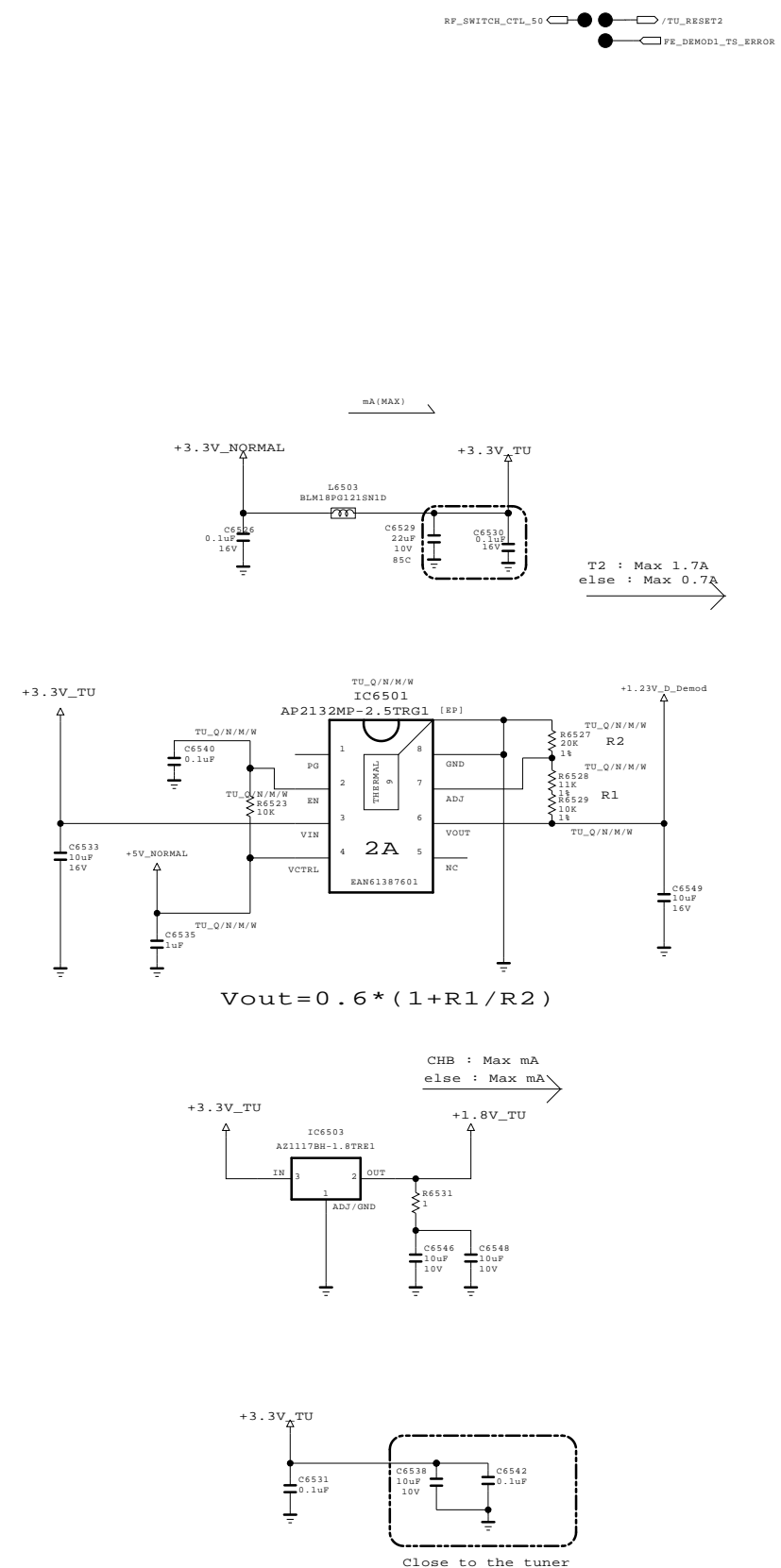
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| BLOCK |         | SHEET | 62 /       |





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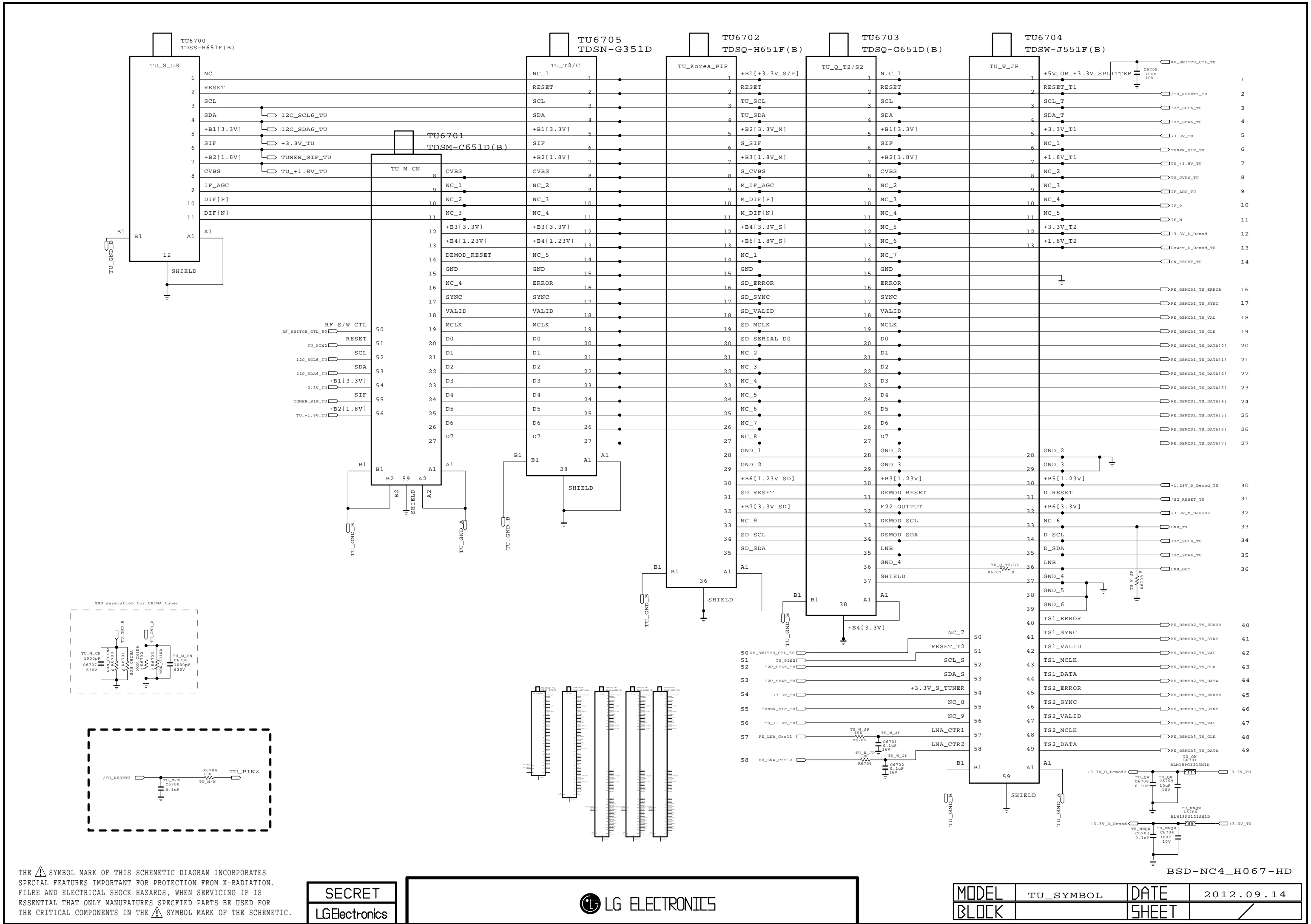
13' Tuner Type for Global
TDS'S'-G501D: T/C Half NIM Horizontal Type
TDS'Q'-G501D: T/C/S2 Combo Horizontal type
TDS'Q'-G601D: T2/C/S2 Combo Horizontal Type
TDS'Q'-G651D: T2/C/S2 Combo Vertical Type
TDS'M'-C601D: China NIM with Isolater Type
TDS'W'-J551F: Japan Dual NIM
TDS'W'-B651F: Brazil 2Tuner
TDS'W'-A651F: Taiwan 2Tuner
TDS'W'-K651F: Colombia DVB-T2 2Tuner

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|       |       |       |            |
|-------|-------|-------|------------|
| MODEL | TUNER | DATE  | 2012.07.10 |
| BLOCK |       | SHEET | 65 /       |

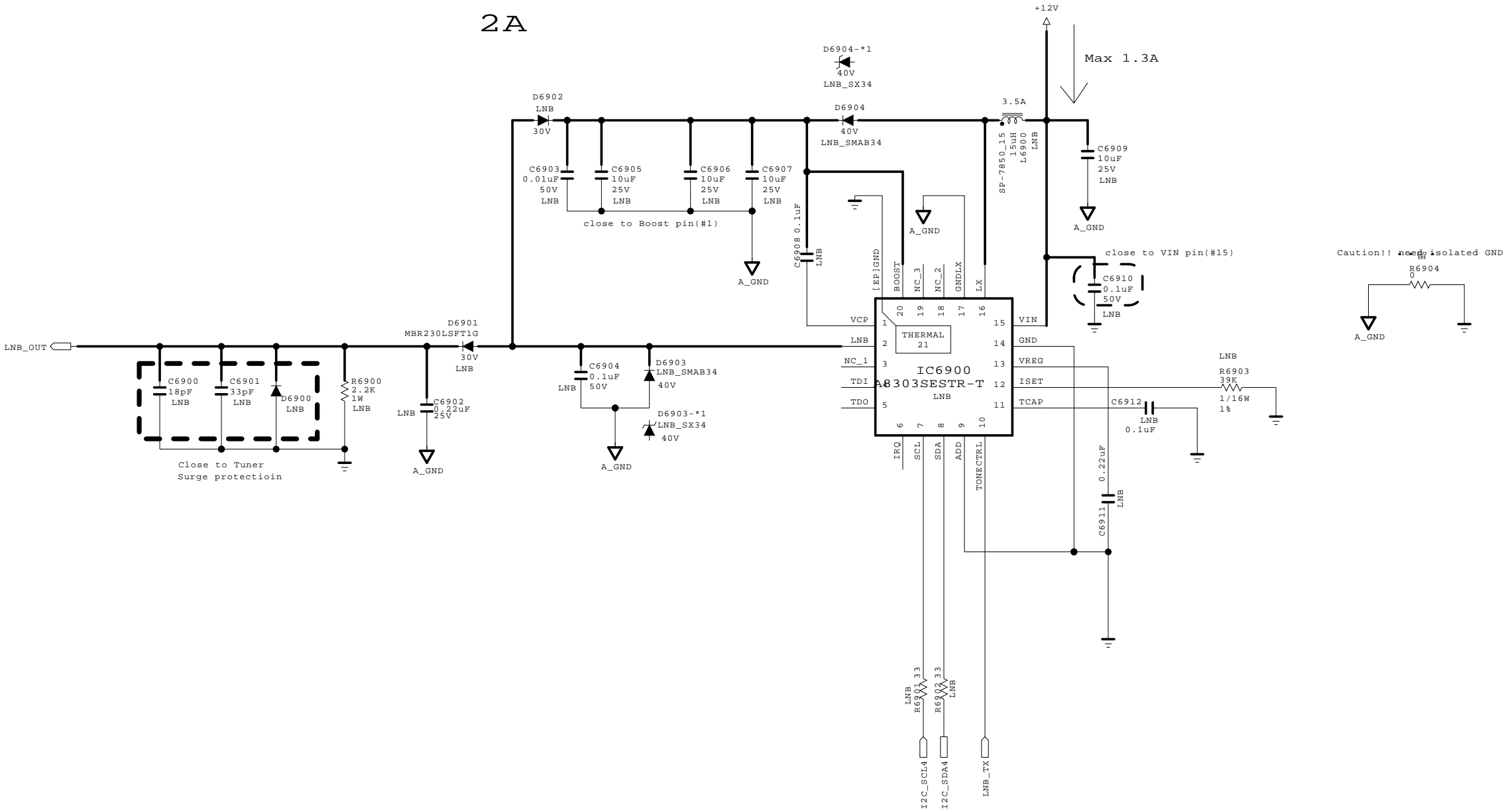




DVB-S2 LNB Part Allegro

(Option:LNB)

3A

Input trace widths should be sized to conduct at least 3A  
Ouput trace widths should be sized to conduct at least 2A



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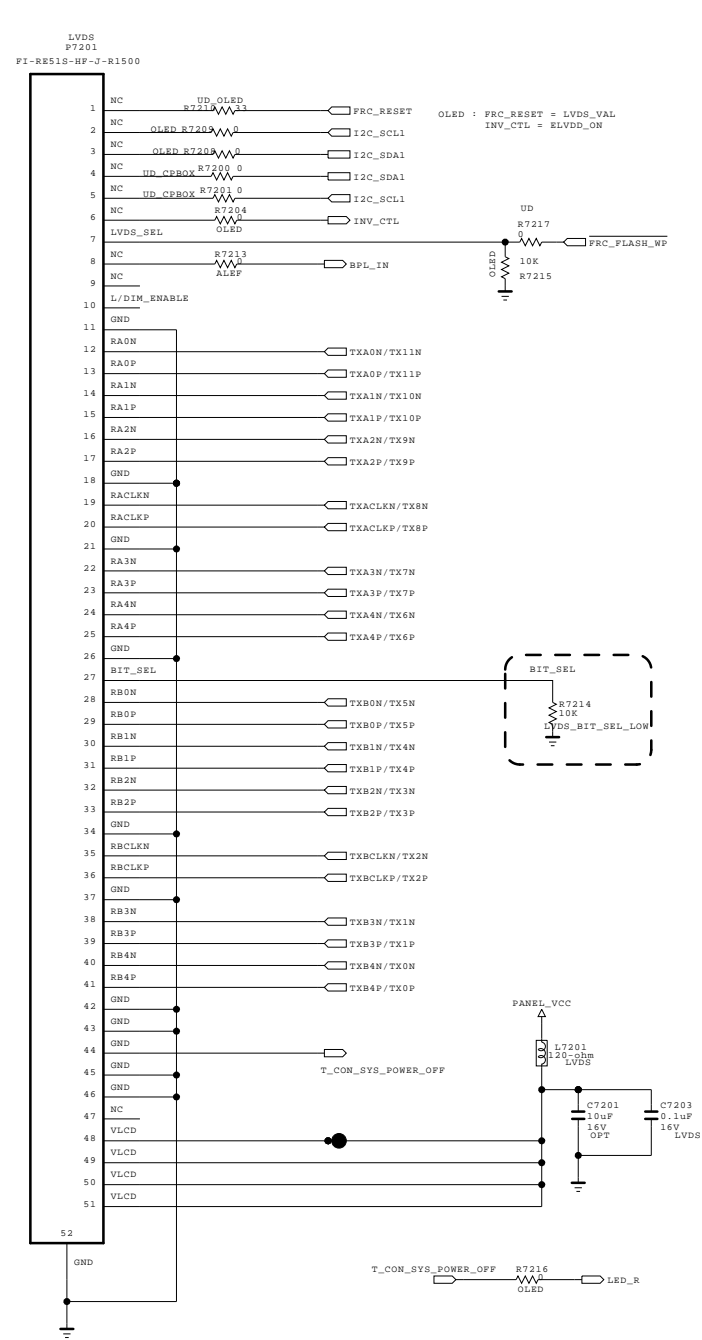
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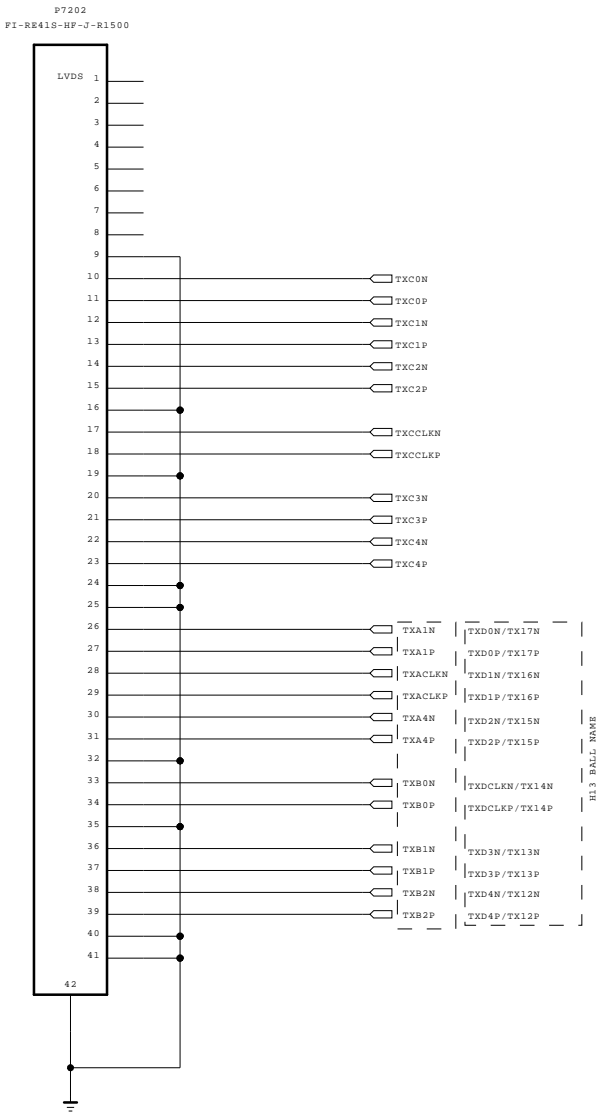
|       |     |       |            |
|-------|-----|-------|------------|
| MODEL | LNB | DATE  | 2012.03.08 |
| BLOCK |     | SHEET | 69 /       |



LVDS

[51Pin LVDS OUTPUT Connector]



[41Pin LVDS OUTPUT Connector]

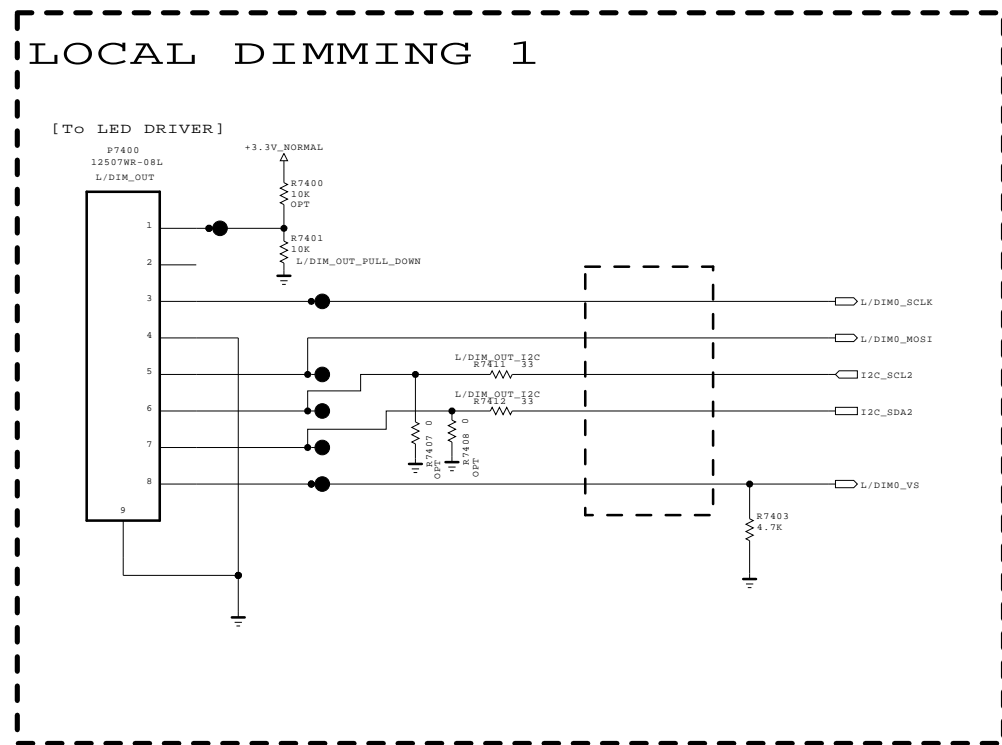




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|       |  |                |  |       |  |            |  |
|-------|--|----------------|--|-------|--|------------|--|
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| BLOCK |  | LVDS INTERFACE |  | SHEET |  | /          |  |

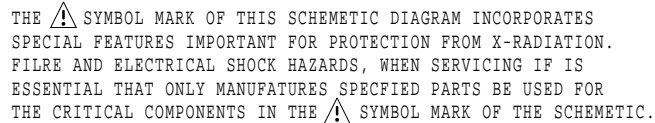


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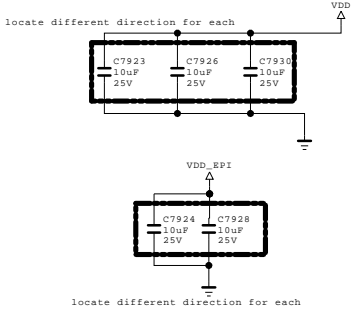
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|-------|---------------|-------|------------|
| MODEL | LOCAL DIMMING | DATE  | 2012.09.14 |
| BLOCK |               | SHEET | /          |



|       |       |       |            |
|-------|-------|-------|------------|
| MODEL |       | DATE  | 2011.12.01 |
| BLOCK | T-Con | SHEET | 77 /       |



THE  SYMBOL MARK OF THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFACTURES SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE  SYMBOL MARK OF THE SCHEMATIC.

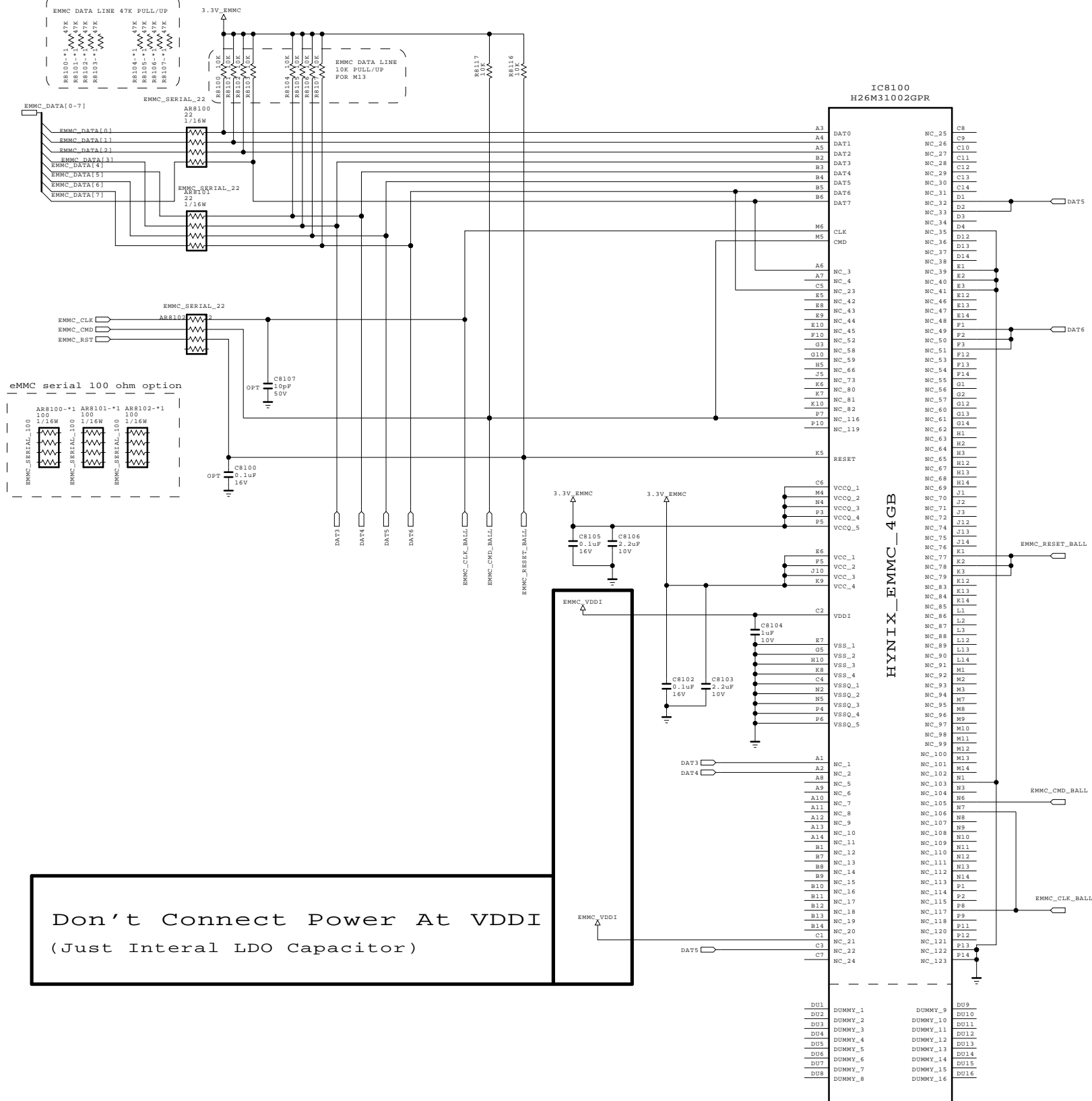
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BSD-NC4\_H079-HD

|       |         |       |            |
|-------|---------|-------|------------|
| MODEL |         | DATE  | 2012.09.14 |
| BLOCK | EPI_CAP | SHEET | /          |

## eMMC I/F



THE SYMBOL MARK OF THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFACTURES SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE SYMBOL MARK OF THE SCHEMATIC.

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LG ELECTRONICS

|       |      |       |          |
|-------|------|-------|----------|
| MODEL | eMMC | DATE  | 11.09.29 |
| BLOCK |      | SHEET | 81       |





# **2013 LED/LCD TV Engineering guide**

**< Applicable Model : High-end Platform >**

# EPI Interface

## ● EPI(Embedded Point-Point Interface)

### ● Features

- Point-Point topology (support 2 Pair option)
- CDR (Clock Data Recovery)
- Bandwidth up to 1.85Gbps/pair at FHD 120Hz 10 bit application
- Lock signal cascading and feedback to T-Con
- Embedded Control Data

### ● Merits

- Better reliability on common noise
- No data skew and better EMI margin
- Fewer lines than mini-LVDS
- Slim PCB design

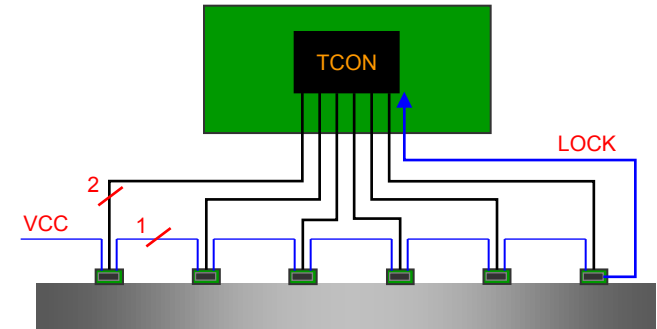


Figure1. Topology

Table 1. Example of FHD 120Hz TV

| EPI               | FHD (10bit) @ 960Ch |          |          |
|-------------------|---------------------|----------|----------|
|                   | 60Hz                | 120Hz    | 240Hz    |
| Transmission Line | 12                  | 12       | 24       |
| Bandwidth         | 0.84Gbps            | 1.68Gbps | 1.68Gbps |

# EPI Interface (mini-LVDS vs. EPI)

## Comparison

### HF mini-LVDS

| HF mini-LVDS  | FHD (10bit) |             |             |
|---------------|-------------|-------------|-------------|
|               | 60Hz        | 120Hz       | 240Hz       |
| No. of Signal | 36          | 36          | 72          |
| Connector     | 60pin (2ea) | 60pin (2ea) | 80pin (2ea) |

- Difficult to upgrade bandwidth limit
- Multiple number of wires needed for higher bandwidth

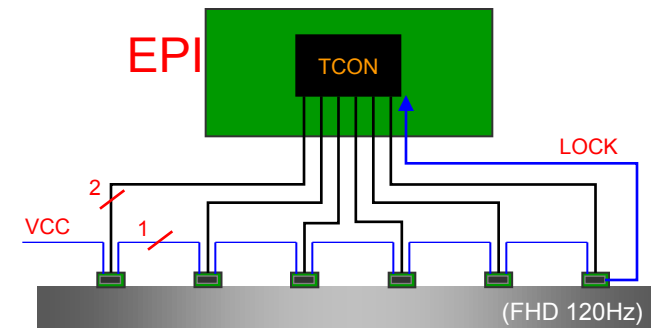
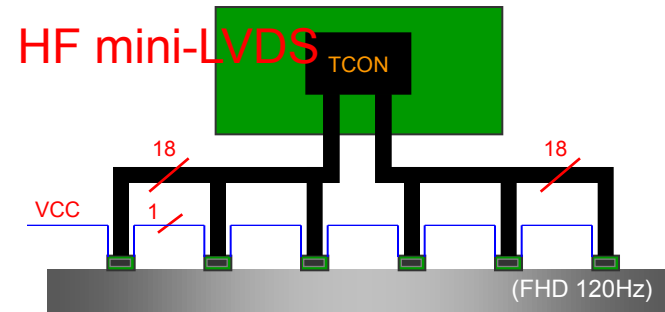
### EPI (Embedded clock P-to-P Interface)

| EPI           | FHD (10bit) |              |             |
|---------------|-------------|--------------|-------------|
|               | 60Hz        | 120Hz        | 240Hz       |
|               | 960ch       | 960ch        | 720ch       |
| No. of Signal | 12          | 12           | 32          |
| Connector     | -           | 50 pin (2ea) | 70pin (2ea) |

- Better reliability on common noise
- No data skew. Better EMI margin
- Lower cost ( Cable, Connector )
- Slim S-PCB design (14mm → 10mm) helps slimmer TV

## What to change

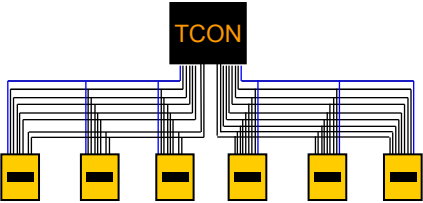
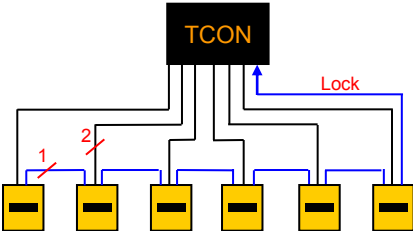
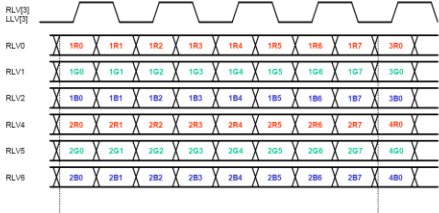

### LCM (T-con to S-Driver IC)



\* Bandwidth Capability

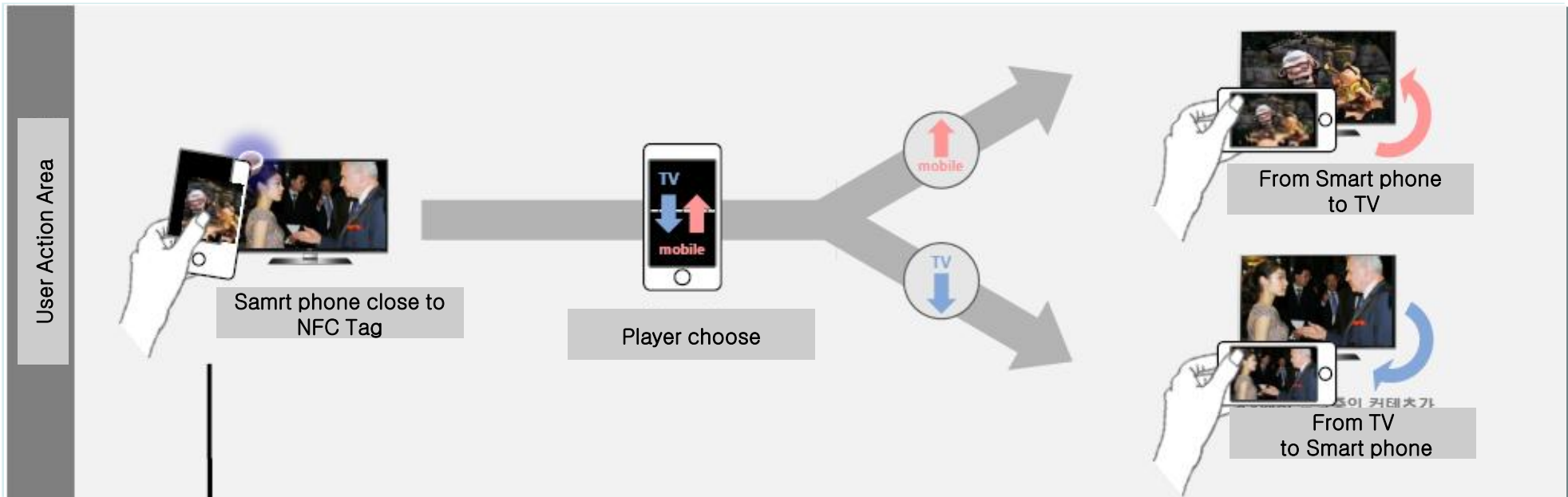
- FHD 120Hz 10Bit : 594Mbps@36Lines → 1.65Gbps@12Lines
- FHD 240Hz 10Bit : 594Mbps@72Lines → 1.25Gbps@32Lines

# EPI Interface (mini-LVDS vs. EPI)

|                            | HF mini-LVDS                                                                                                                                          | EPI                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |     |      |             |      |    |                                                    |        |   |                                                                                                                      |        |     |                    |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|-------------|------|----|----------------------------------------------------|--------|---|----------------------------------------------------------------------------------------------------------------------|--------|-----|--------------------|
| Topology                   |                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                   |     |      |             |      |    |                                                    |        |   |                                                                                                                      |        |     |                    |
| Protocol                   |                                                                     |  <table><thead><tr><th>Bit</th><th>Name</th><th>Description</th></tr></thead><tbody><tr><td>0, 1</td><td>CK</td><td>Indicates a rising edge of bit clock. (Always "H")</td></tr><tr><td>2 ~ 30</td><td>-</td><td>RGB data are transmitted. LSB is transmitted at first.<br/>2 ~ 11 : R0 ~ R9<br/>12 ~ 21 : G0 ~ G9<br/>22 ~ 31 : B0 ~ B9</td></tr><tr><td>32, 33</td><td>DMY</td><td>Dummy (Always "L")</td></tr></tbody></table> | Bit | Name | Description | 0, 1 | CK | Indicates a rising edge of bit clock. (Always "H") | 2 ~ 30 | - | RGB data are transmitted. LSB is transmitted at first.<br>2 ~ 11 : R0 ~ R9<br>12 ~ 21 : G0 ~ G9<br>22 ~ 31 : B0 ~ B9 | 32, 33 | DMY | Dummy (Always "L") |
| Bit                        | Name                                                                                                                                                  | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |     |      |             |      |    |                                                    |        |   |                                                                                                                      |        |     |                    |
| 0, 1                       | CK                                                                                                                                                    | Indicates a rising edge of bit clock. (Always "H")                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |     |      |             |      |    |                                                    |        |   |                                                                                                                      |        |     |                    |
| 2 ~ 30                     | -                                                                                                                                                     | RGB data are transmitted. LSB is transmitted at first.<br>2 ~ 11 : R0 ~ R9<br>12 ~ 21 : G0 ~ G9<br>22 ~ 31 : B0 ~ B9                                                                                                                                                                                                                                                                                                                                                                                                 |     |      |             |      |    |                                                    |        |   |                                                                                                                      |        |     |                    |
| 32, 33                     | DMY                                                                                                                                                   | Dummy (Always "L")                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |     |      |             |      |    |                                                    |        |   |                                                                                                                      |        |     |                    |
| Features<br>@10bit, FHD120 | <ul style="list-style-type: none"><li>• Multi Drop</li><li>• Data rate: 660Mbps</li><li>• External clock</li></ul>                                    | <ul style="list-style-type: none"><li>• Point to Point</li><li>• Data rate : 1.8Gbps</li><li>• Embedded clock, Control</li></ul>                                                                                                                                                                                                                                                                                                                                                                                     |     |      |             |      |    |                                                    |        |   |                                                                                                                      |        |     |                    |
| Merit                      | <ul style="list-style-type: none"><li>• Simple structure</li><li>• Standardization</li></ul>                                                          | <ul style="list-style-type: none"><li>• Fewer Lines : 12</li><li>• Embedded clock<br/>: low EMI, Clock skew free</li><li>• Easy to PCB design</li></ul>                                                                                                                                                                                                                                                                                                                                                              |     |      |             |      |    |                                                    |        |   |                                                                                                                      |        |     |                    |
| Demerit                    | <ul style="list-style-type: none"><li>• Too many lines : 36</li><li>• Clock skew</li><li>• EMI due to clock lines</li><li>• Bandwidth limit</li></ul> | <ul style="list-style-type: none"><li>• Transmission Overhead<br/>: 4bit delimiter</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                         |     |      |             |      |    |                                                    |        |   |                                                                                                                      |        |     |                    |

# NFC (Near field communication)

Near field communication (NFC) is a set of standards for smartphones and similar devices to establish radio communication with each other by touching them together or bringing them into close proximity, usually no more than a few centimetres. Present and anticipated applications include contactless transactions, data exchange, and simplified setup of more complex communications such as Wi-Fi. Communication is also possible between an NFC device and an unpowered NFC chip, called a "tag".



## Tag On



Tag On

Touch the smartphone to the Tag On sticker.

- Using an LG smartphone with the NFC and Miracast functions, you can:

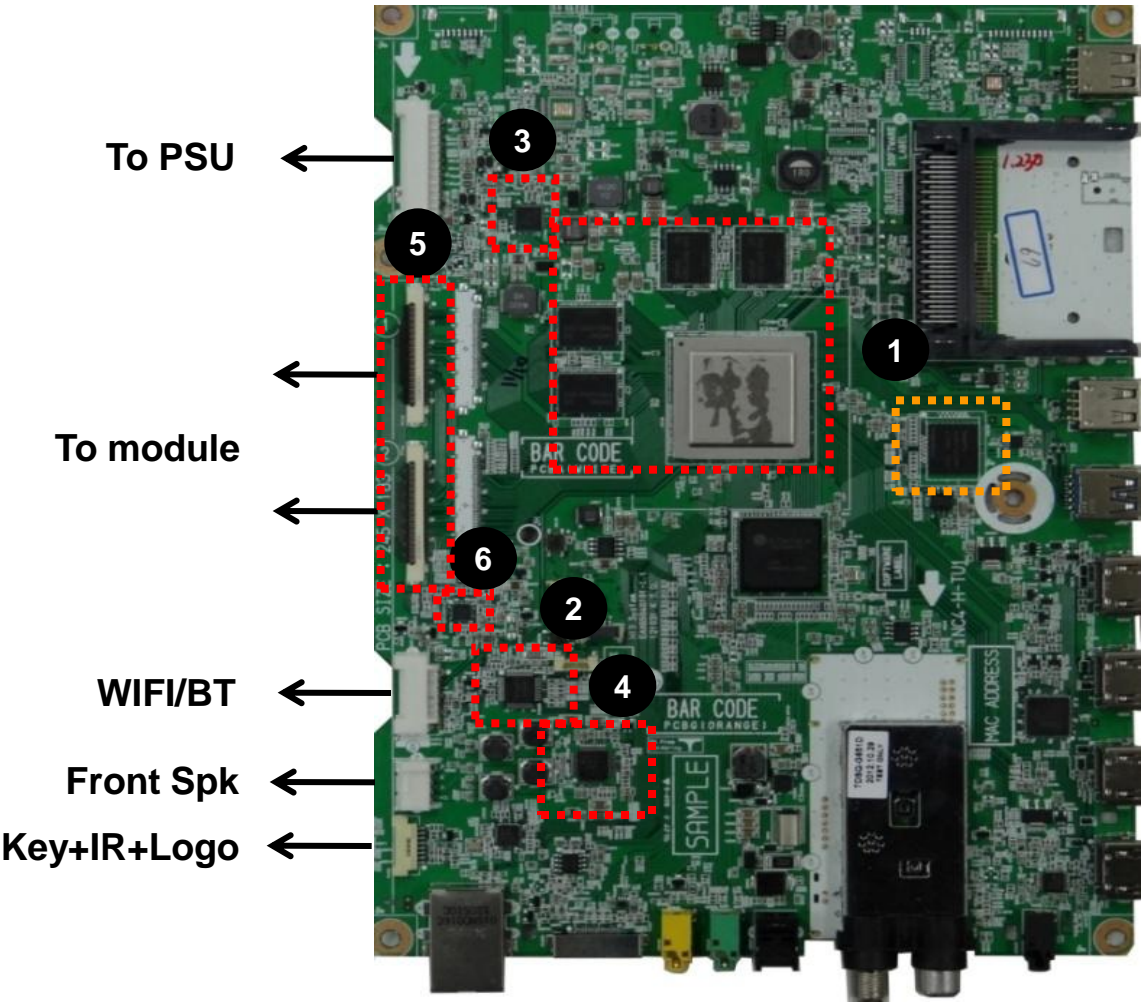
- TV to Phone: run the LG TV Remote app on the smartphone.
- Phone to TV: view the screen of the smartphone on the TV.

To end the connection, touch the smartphone to the Tag On sticker again.

(You can also disable the Miracast function on the smartphone.)

xxLA790V-Zx

Chassis : LD34D  
PCB P/No : EAX65040103



- 1 Main processor, DDR Memory  
eMMC Memory
- 2 Micom for Key/IR/Logo sensing
- 3 PMIC
- 4 Audio AMP
- 5 EPI Wafer
- 6 Level shifter

## Main PCB for Broadband

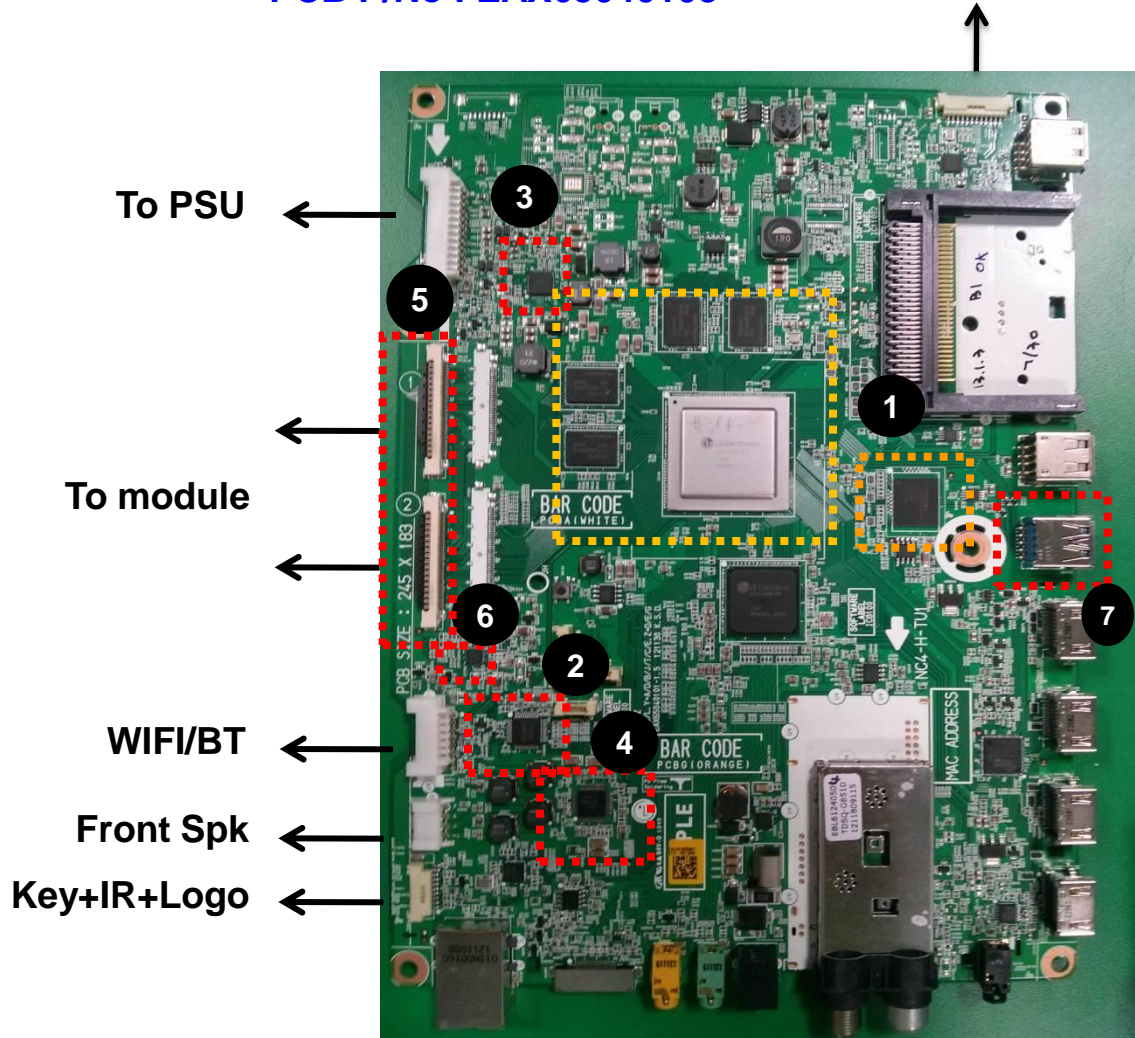
## Main + TCON all in one

xxLA860V-Zx

**Chassis : LD34D**

**PCB P/No : EAX65040103**

## To Camera



- 1 Main processor, DDR Memory  
eMMC Memory
- 2 Micom for Key/IR/Logo sensing
- 3 PMIC
- 4 Audio AMP
- 5 EPI Wafer
- 6 Level shifter
- 7 USB 3.0



# Main PCB for Broadband

Main + TCON all in one

xxLA960V-Zx

Chassis : LD34D

PCB P/No : EAX65040103

To LED Driver

To Woofer

To Camera

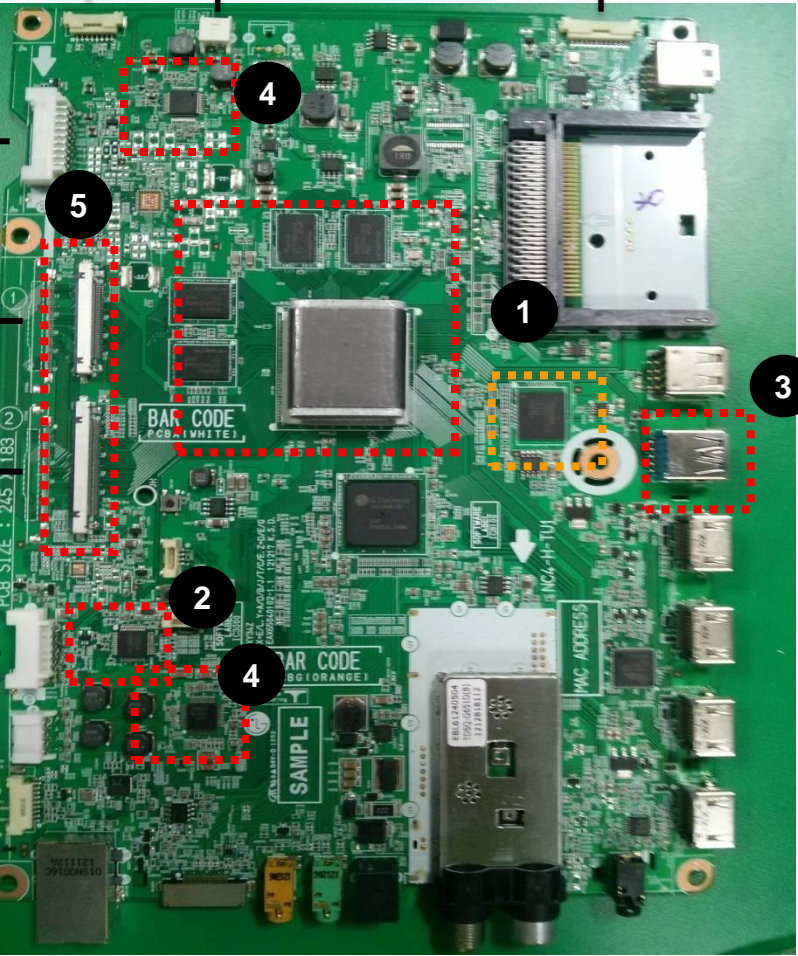
To PSU

To module

WIFI/BT

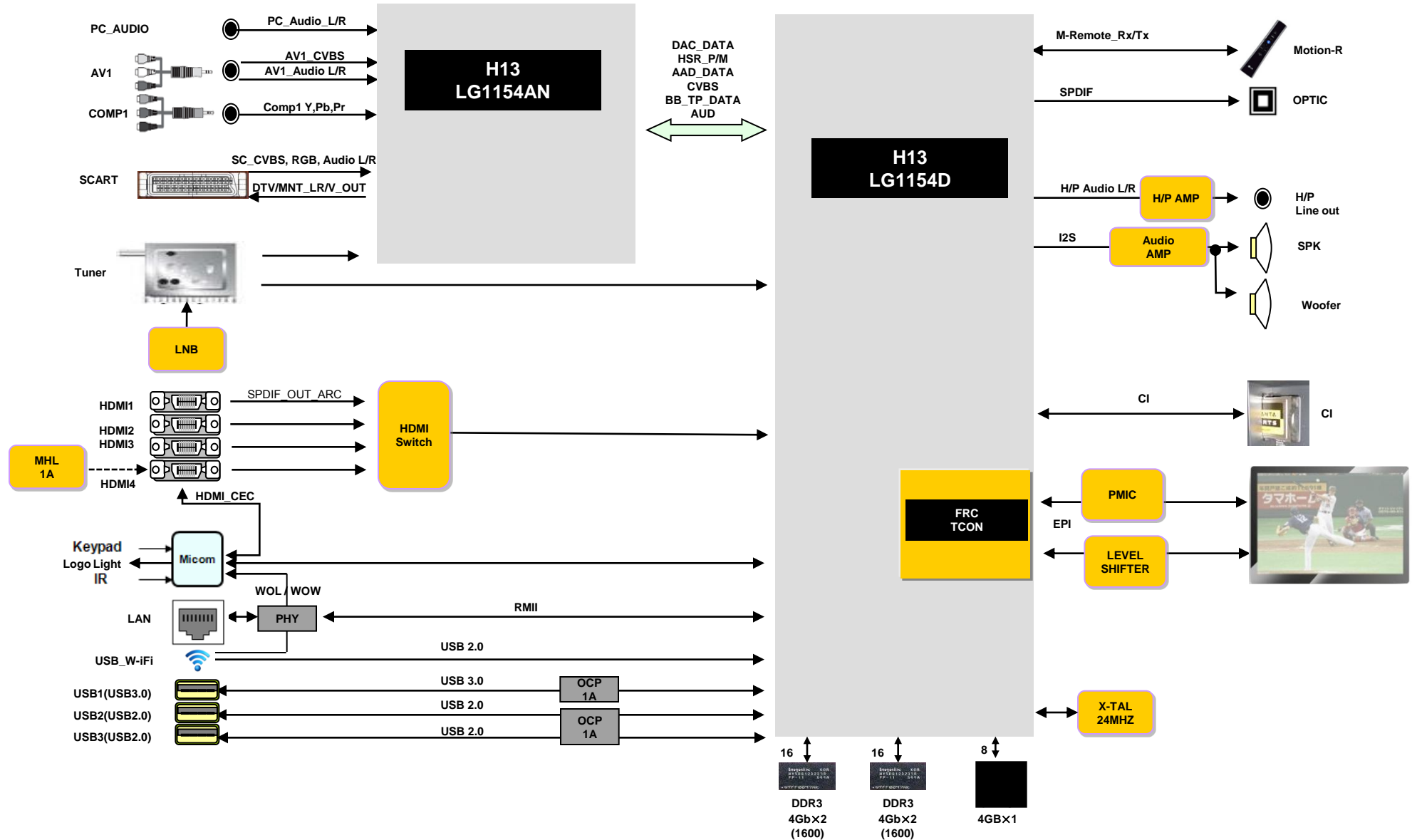
Front Spk

Key+IR+Logo

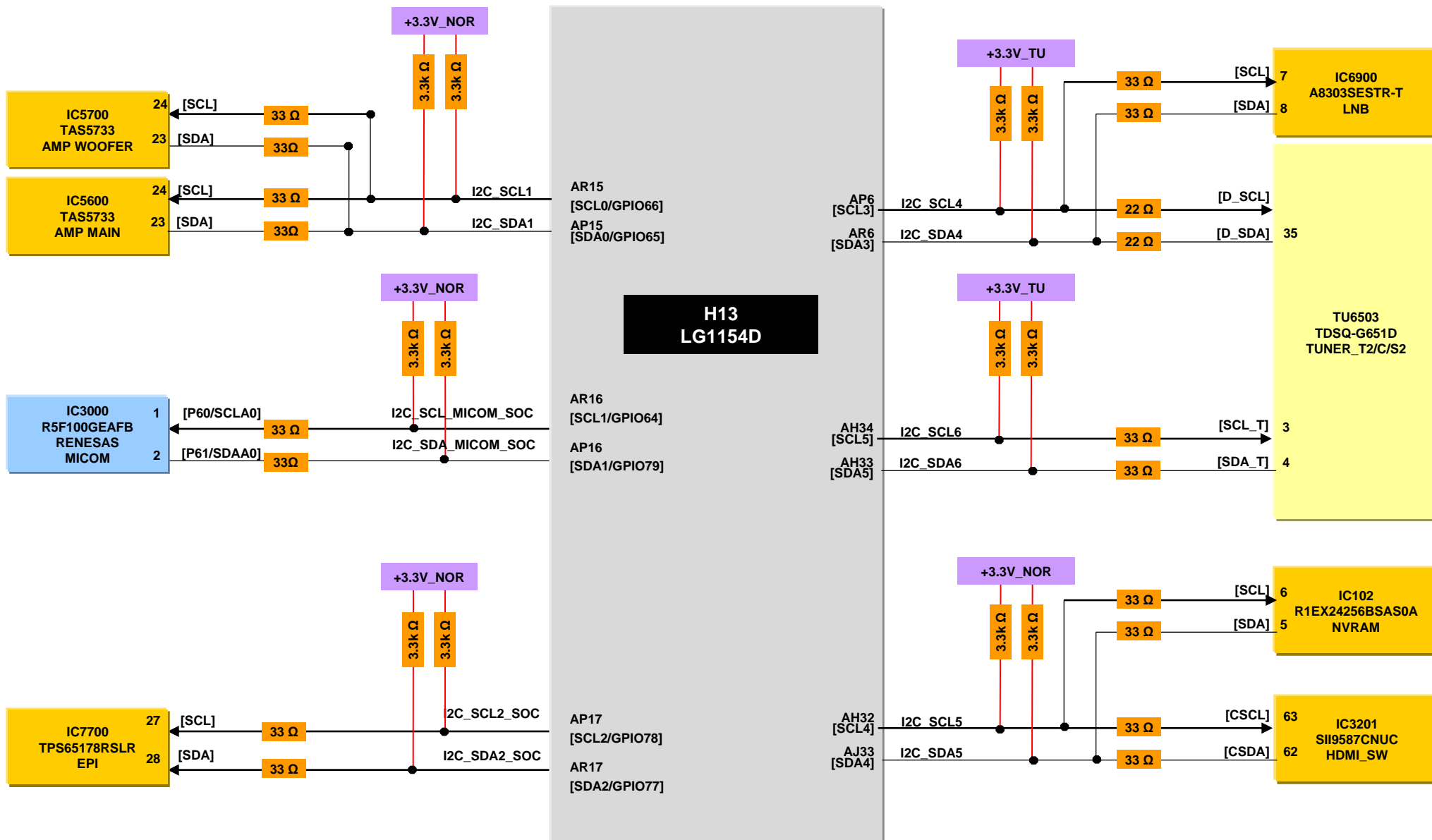


- 1 Main processor, DDR Memory  
eMMC Memory
- 2 Micom for Key/IR/Logo sensing
- 3 USB 3.0
- 4 Audio AMP
- 5 LVDS Wafer

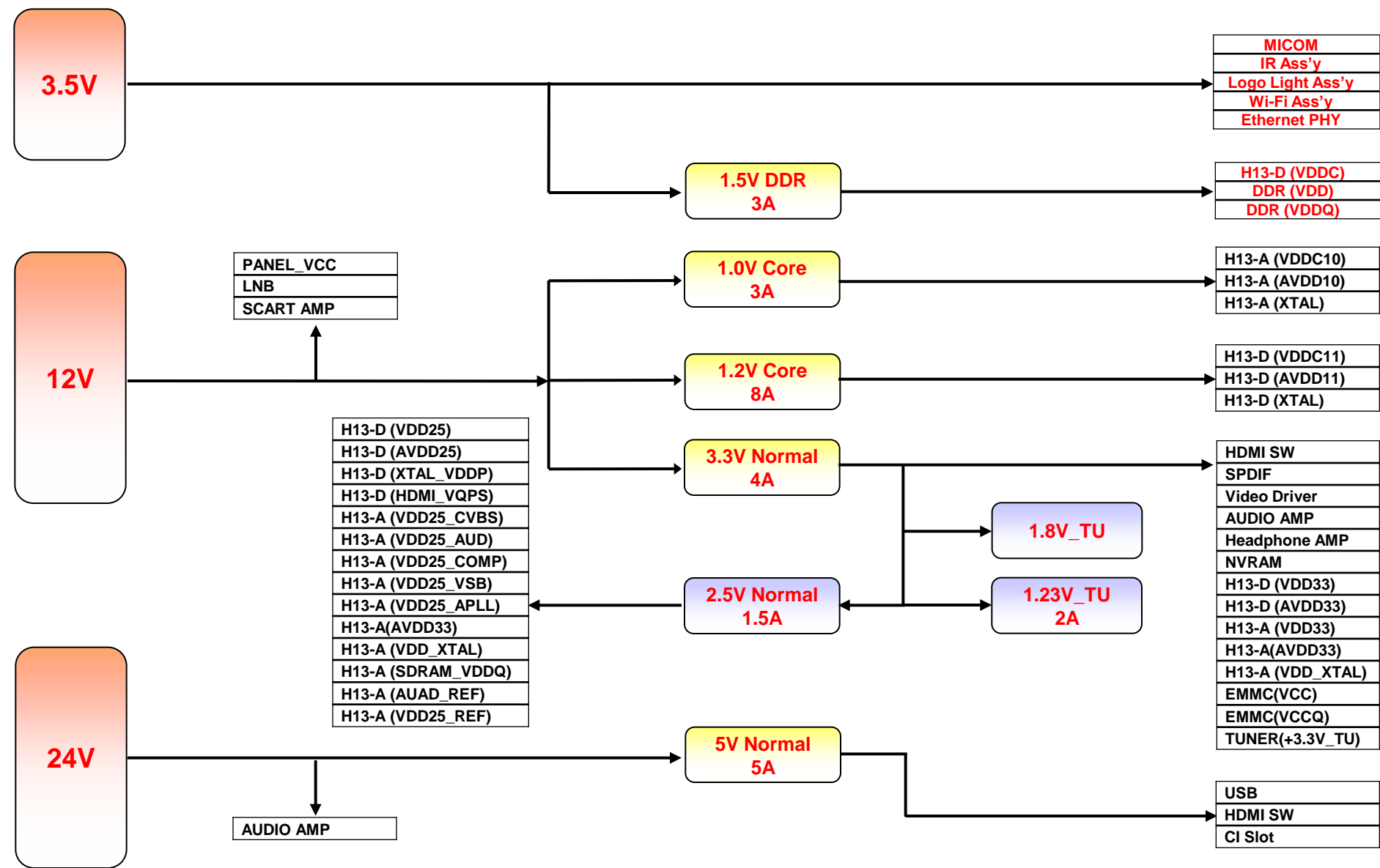
# 1. H13 Block Diagram (External)



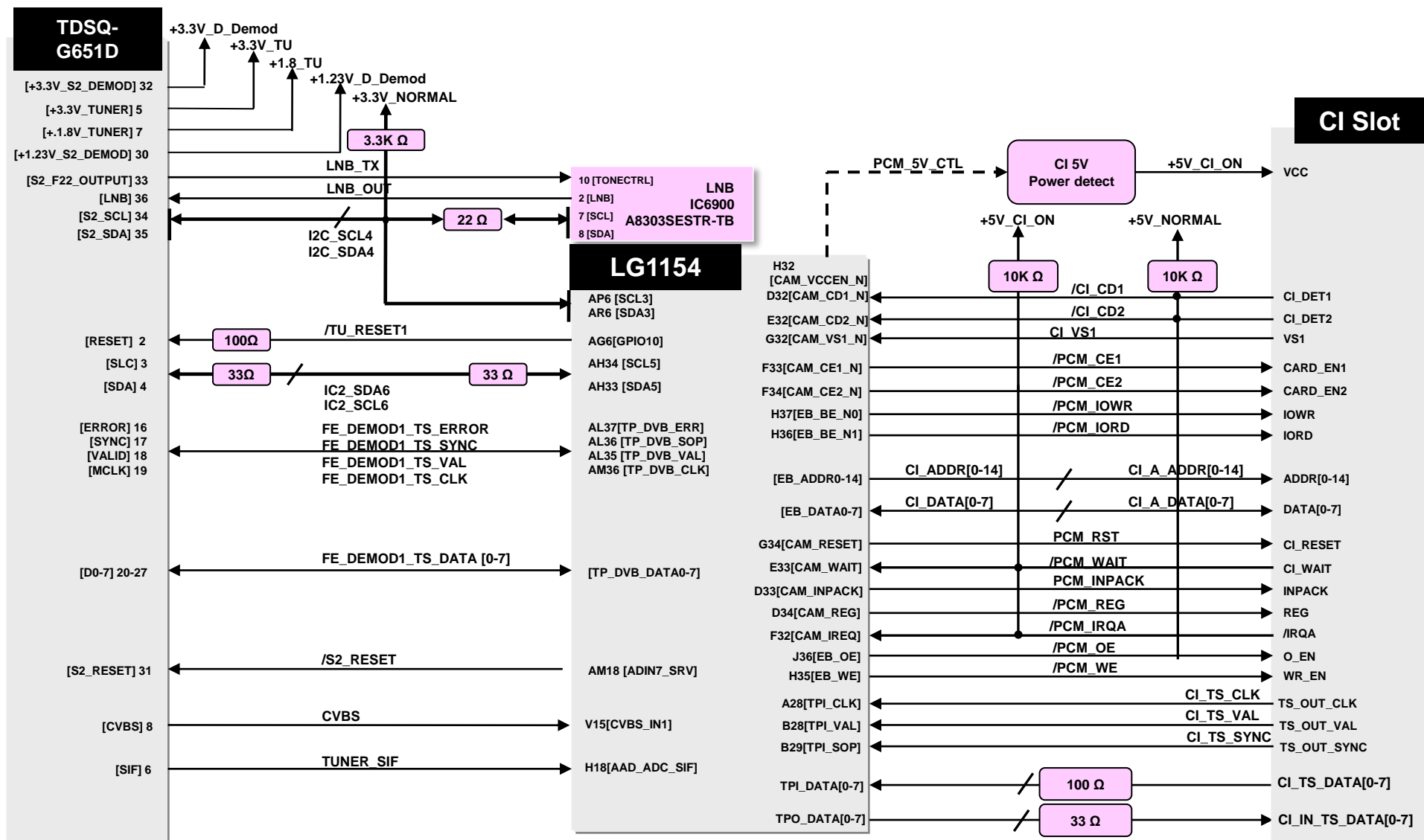
## 2. LG1154 I2C Map



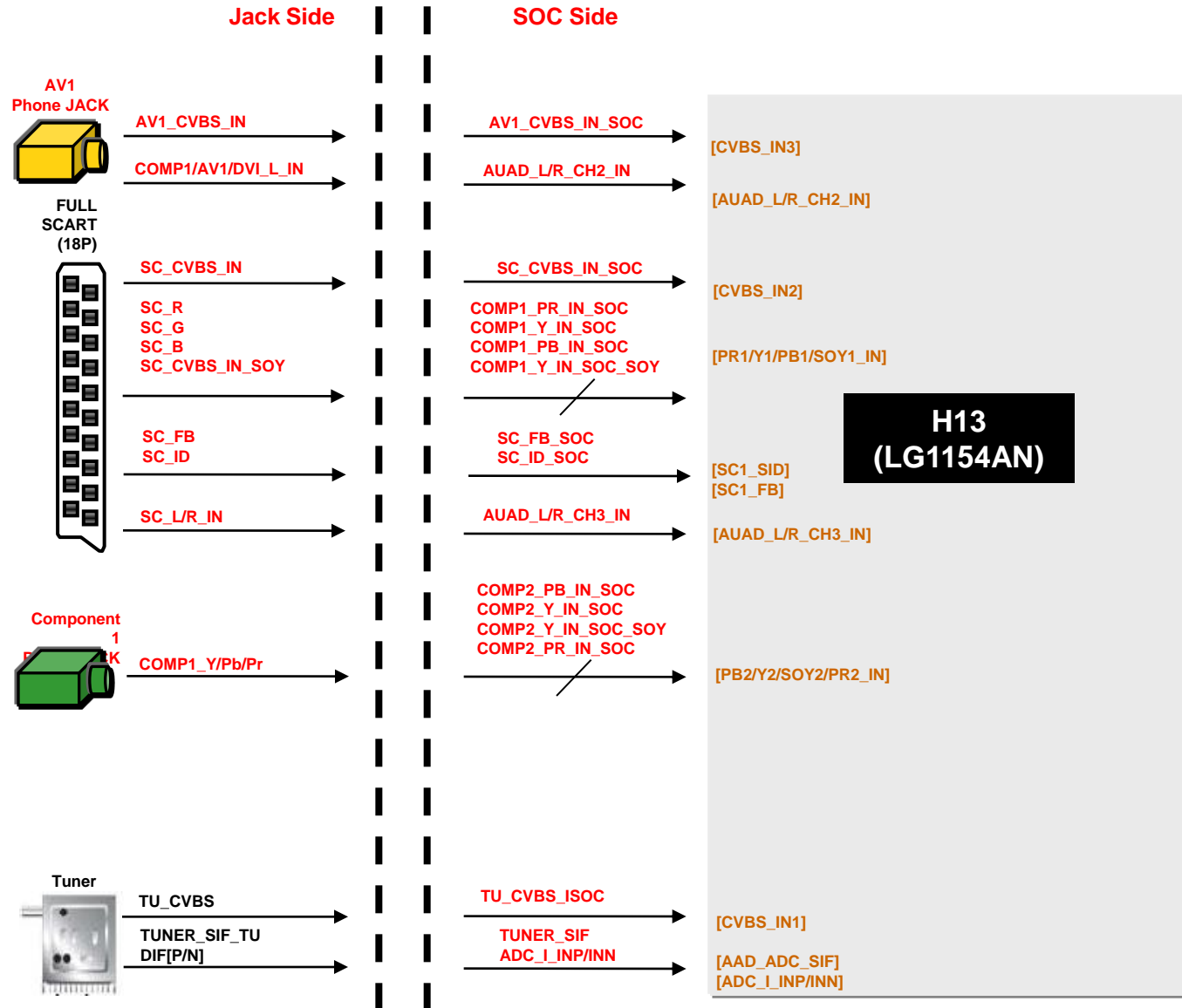
# 3. Power Block Diagram



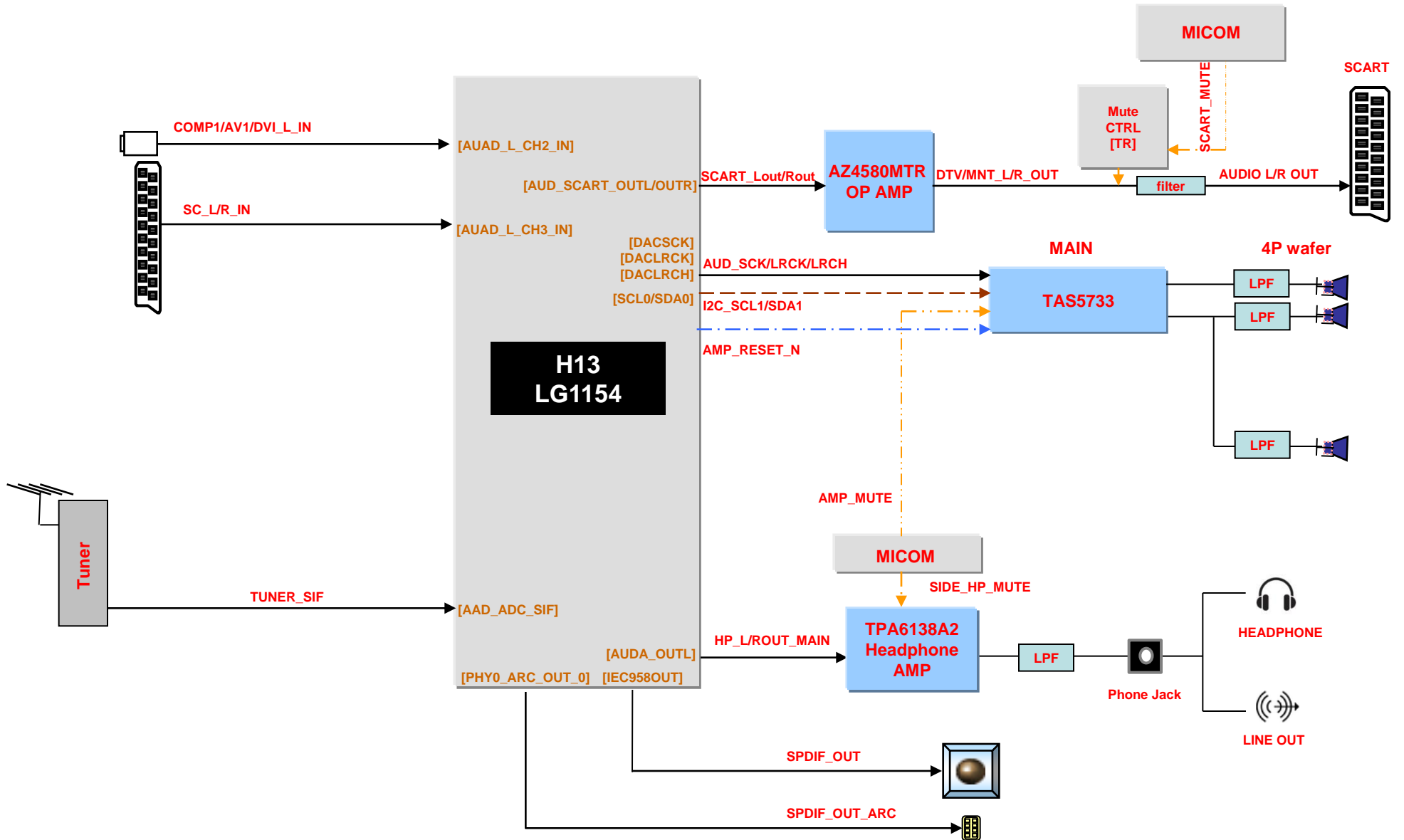
# 4. Tuner/CI Block Diagram



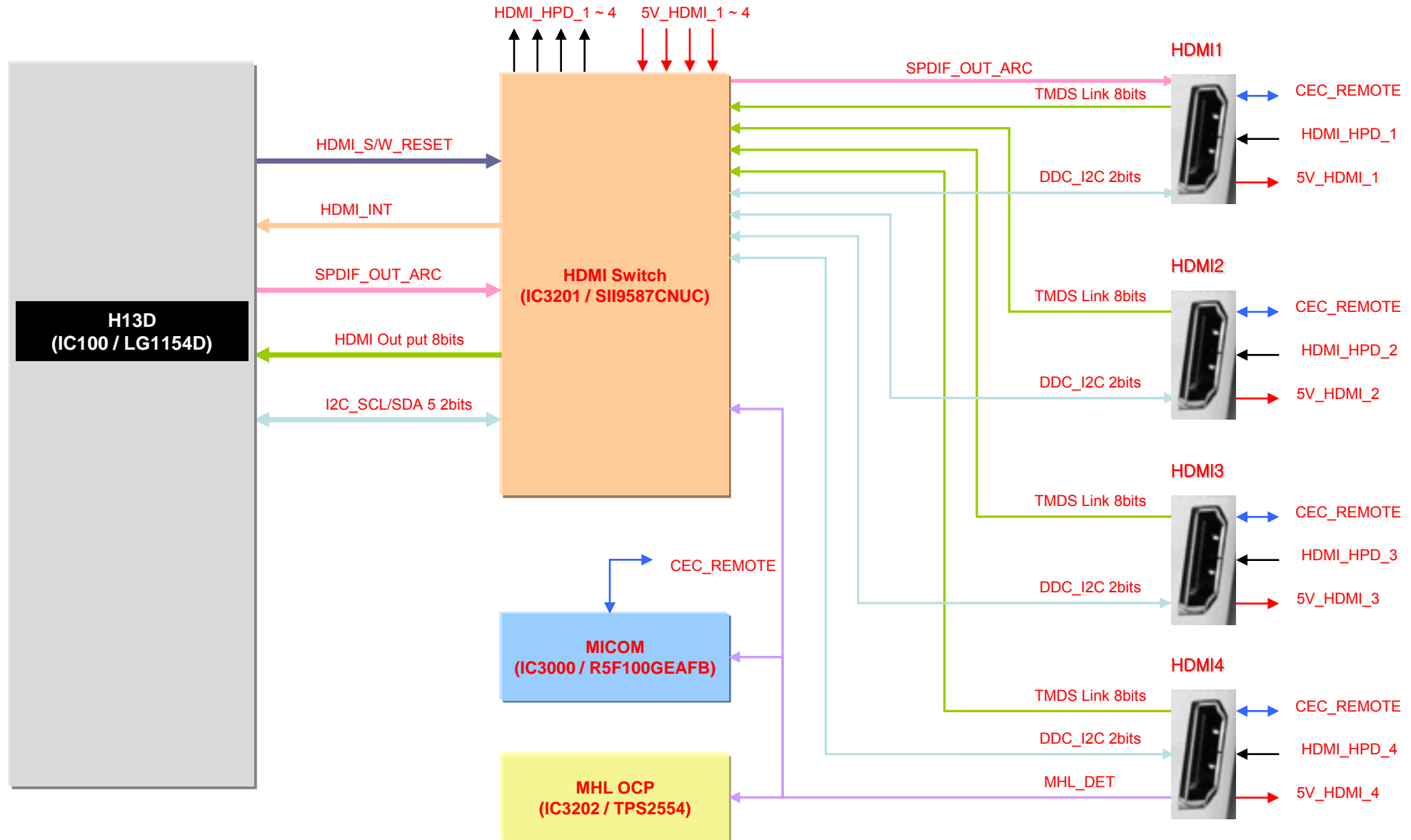
## 5. Video & Audio IN



## 6. AUDIO OUT

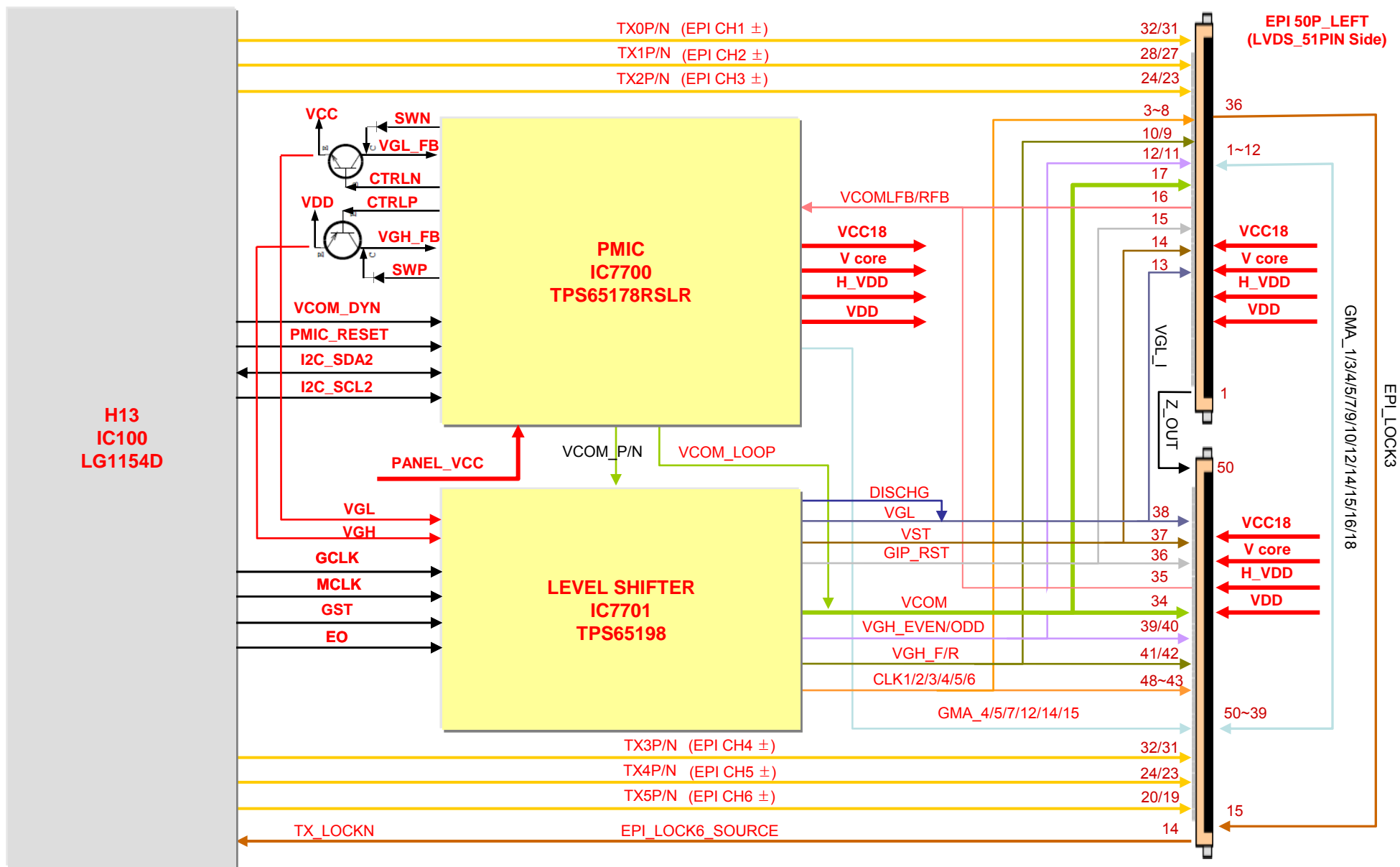


# 7. HDMI

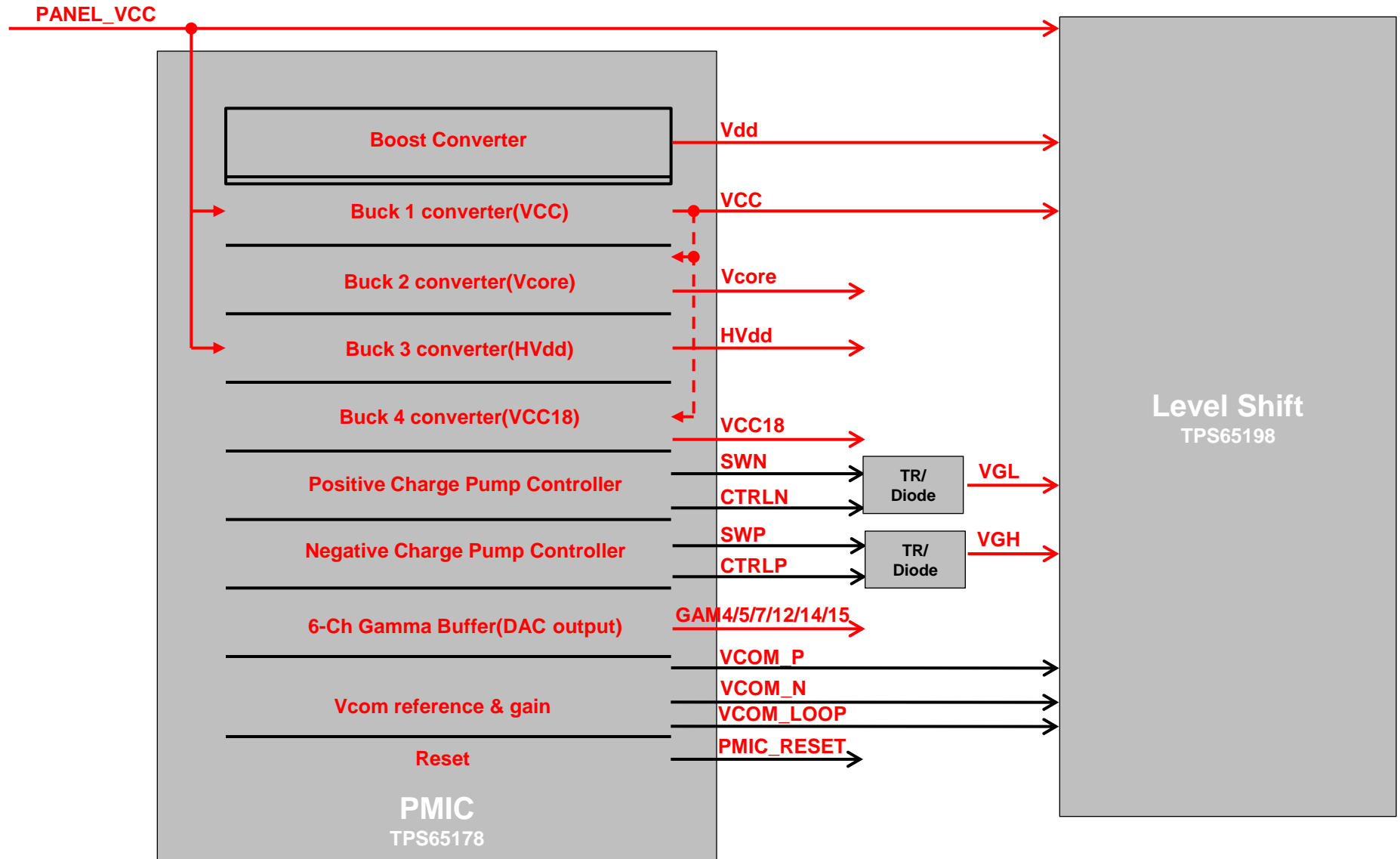




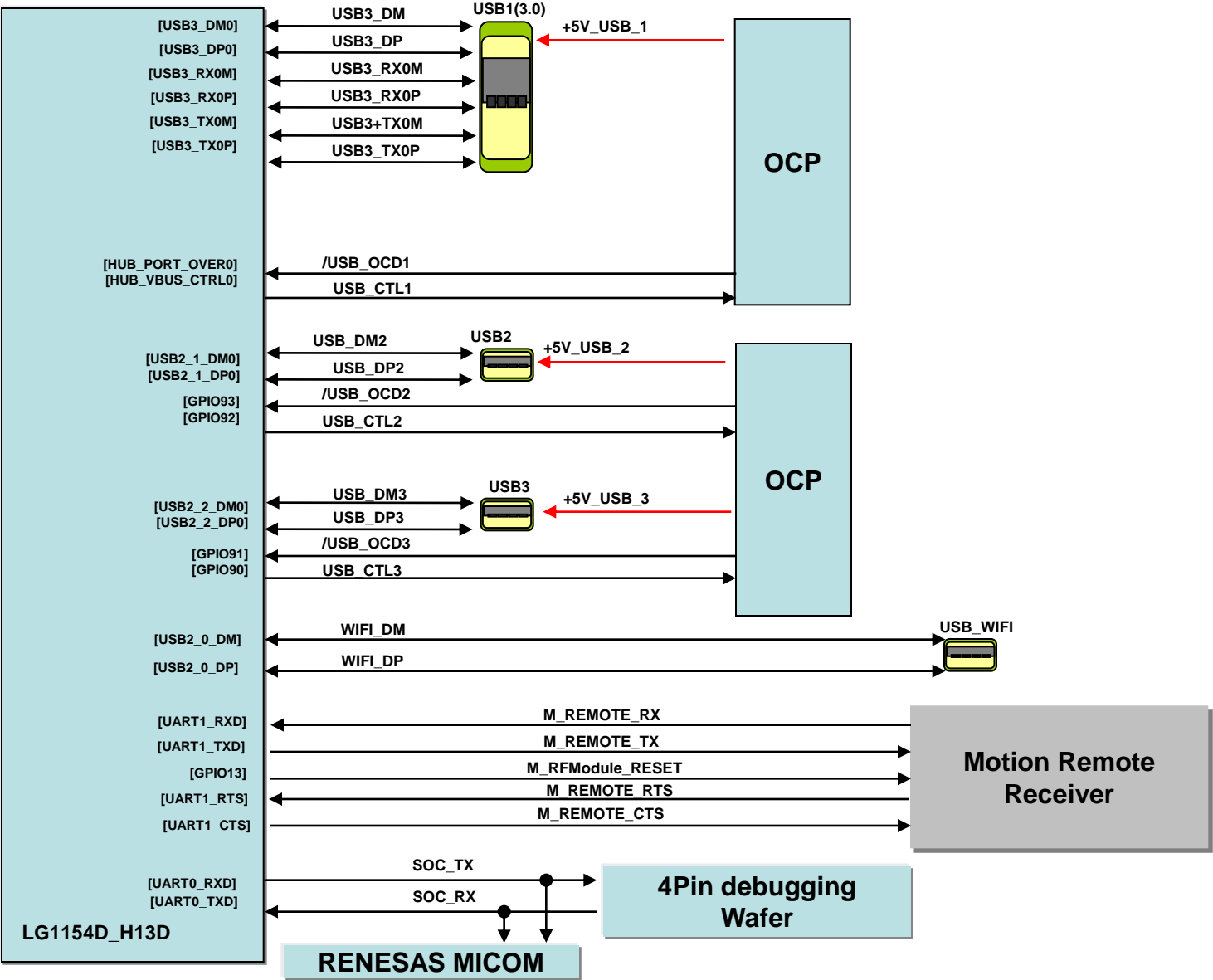
# 8. Panel Interface Block Diagram



## 9. PMIC & Level Shift Bloc Diagram

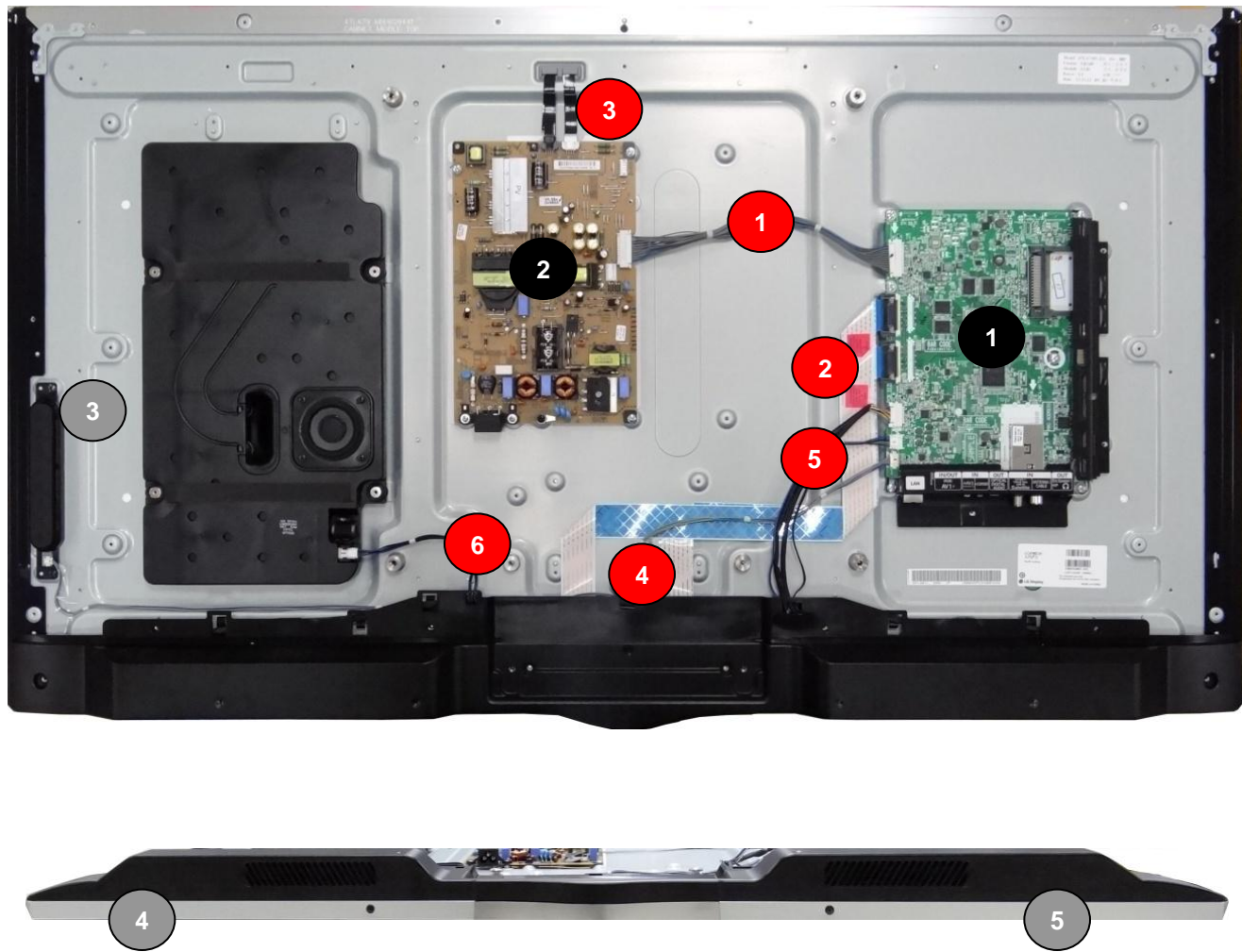


# 10. USB / WIFI / M-REMOTE / UART



# Interconnection - 1

47LA790V-ZA



## [PCBs]

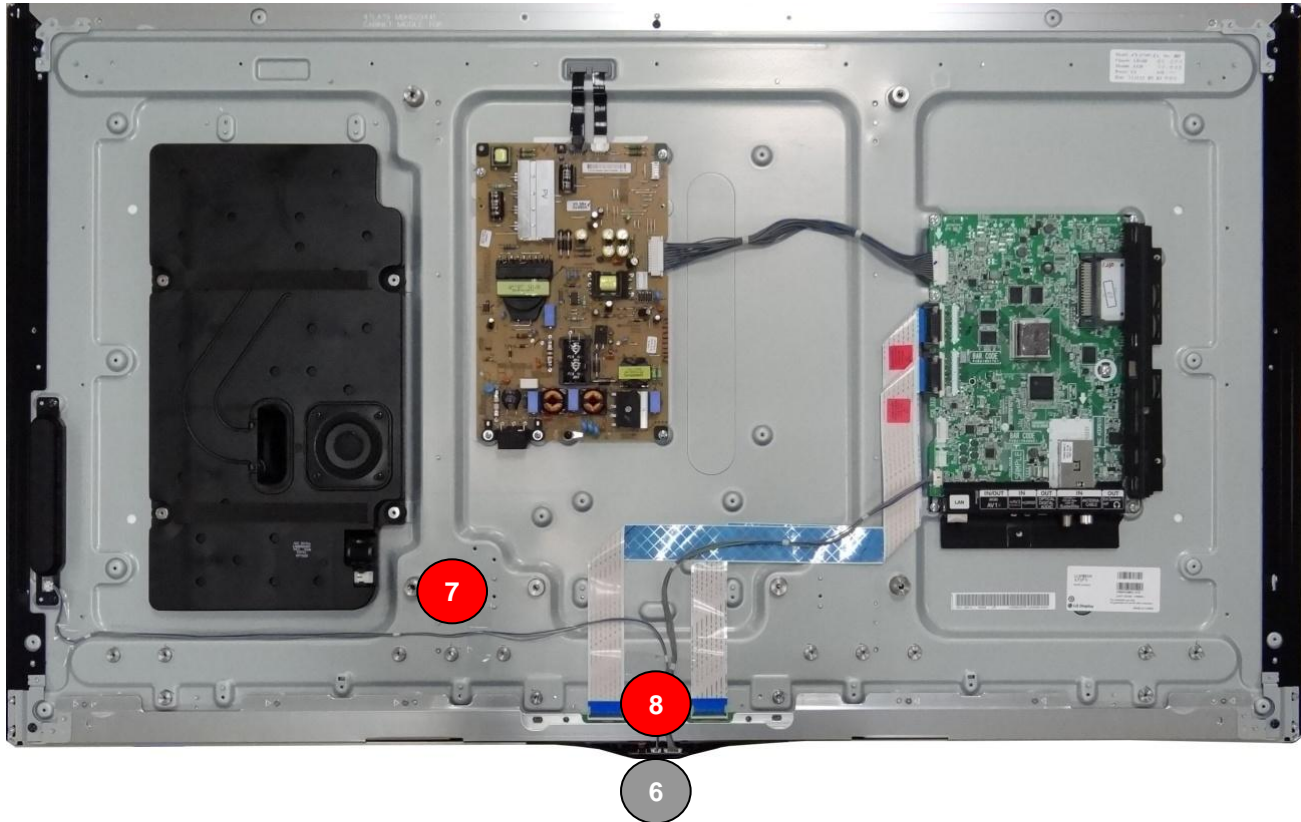
- 1 Main PCB
- 2 Power Board
- 3 Local key Assy
- 4 RF Assy
- 5 WIFI Assy

## [Cables]

- 1 Main / LPB 24Pin + Local Dimming Cable
- 2 Main / Module EPI Cable 50& 50Pin
- 3 LED driver / PSU
- 4 IR 8Pin Cable
- 5 WiFi 6Pin + RF 8Pin Cable
- 6 SPK Cable

# Interconnection - 2

47LA790V-ZA



[PCBs]

6 IR Assy

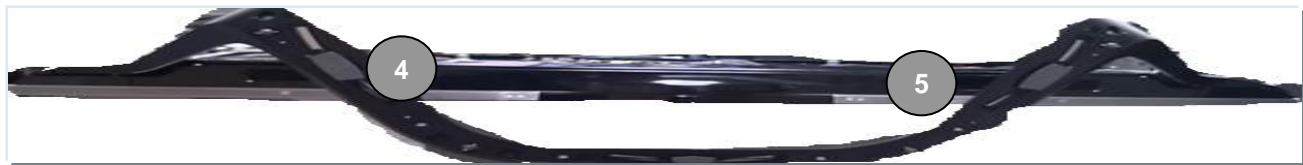
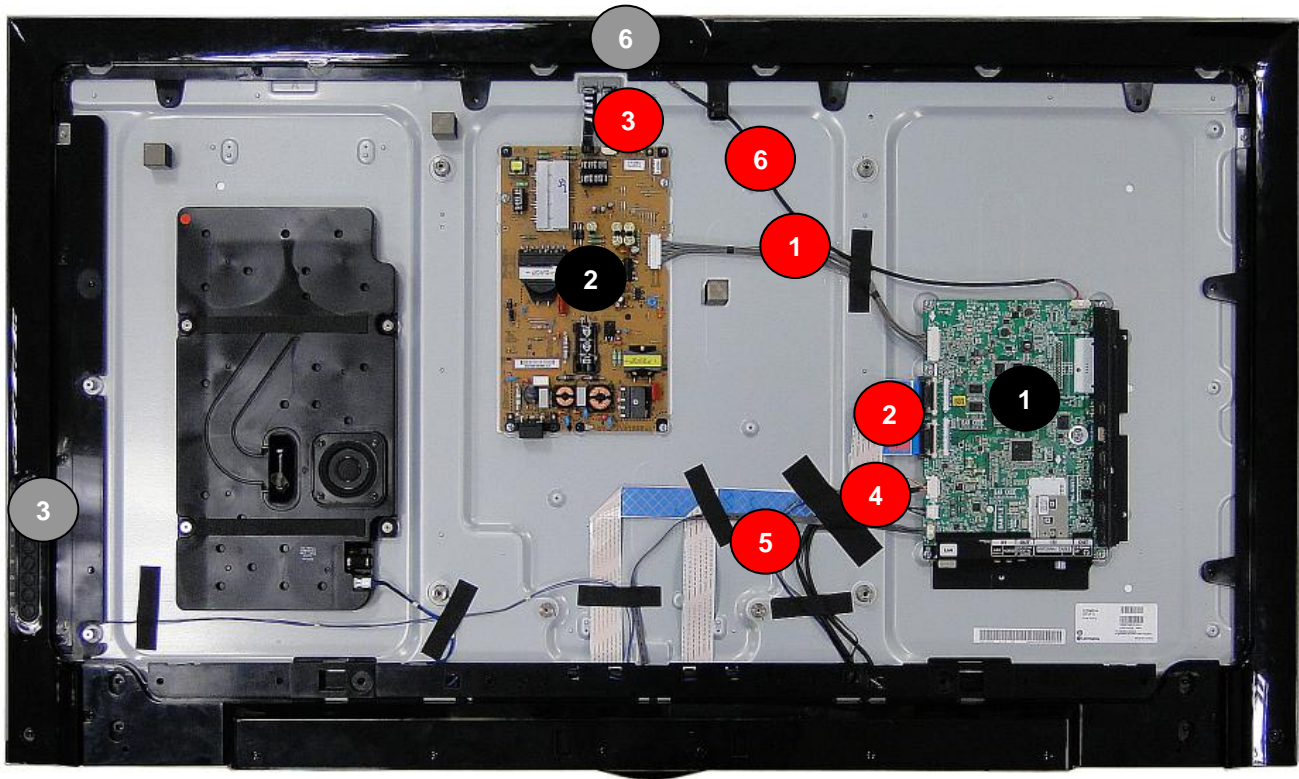
[Cables]

7 IR to Local Key 3Pin Cable

8 IR to Logo Assy 4Pin Cable

# Interconnection - 1

55LA860V-ZA



## [PCBs]

- 1 Main PCB
- 2 Power Board
- 3 Local key Assy
- 4 RF Assy
- 5 WIFI Assy
- 6 Camera Assy

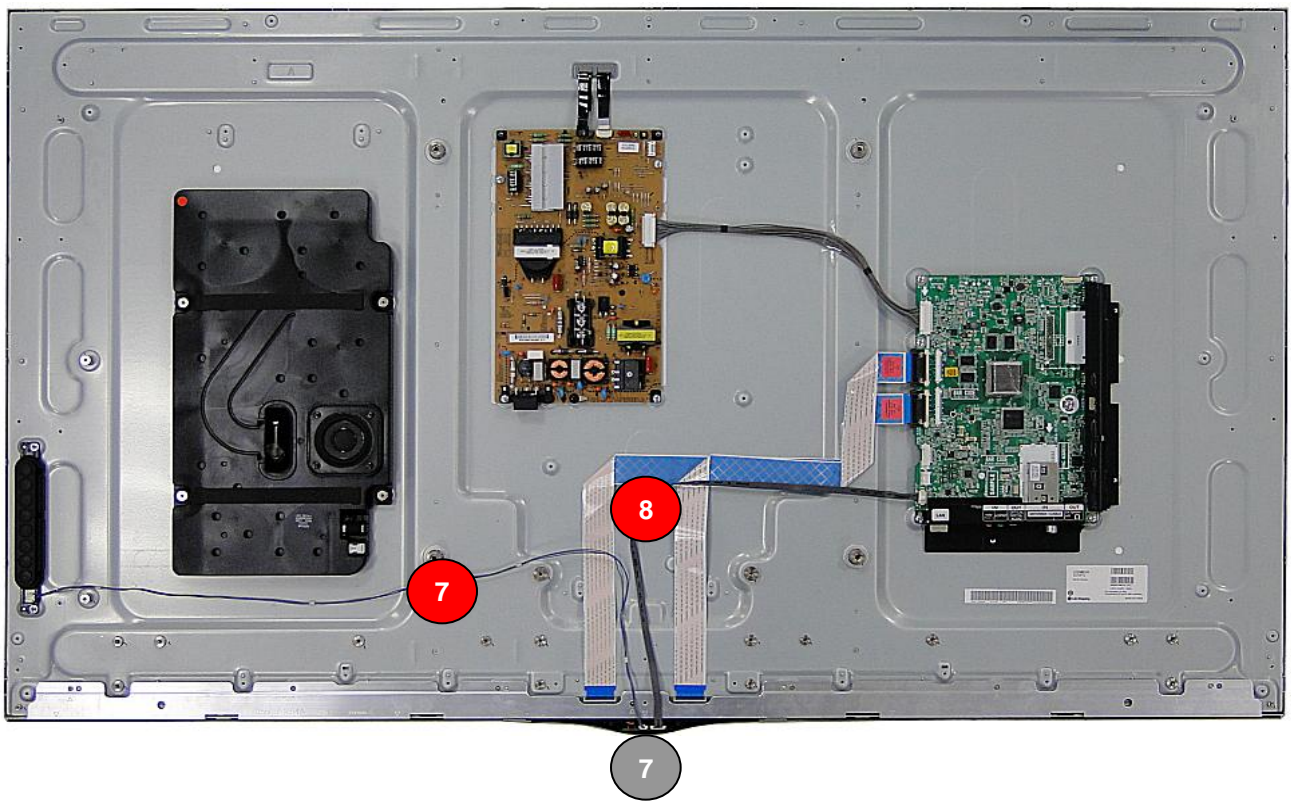
## [Cables]

- 1 Main / LPB 24Pin + Local Dimming Cable
- 2 Main / Module EPI Cable 50& 50Pin
- 3 LED driver / PSU
- 4 WiFi 6Pin + RF 8Pin Cable
- 5 SPK Cable
- 6 Camera Cable



# Interconnection - 2

55LA860V-ZA



## [PCBs]

7 IR Assy

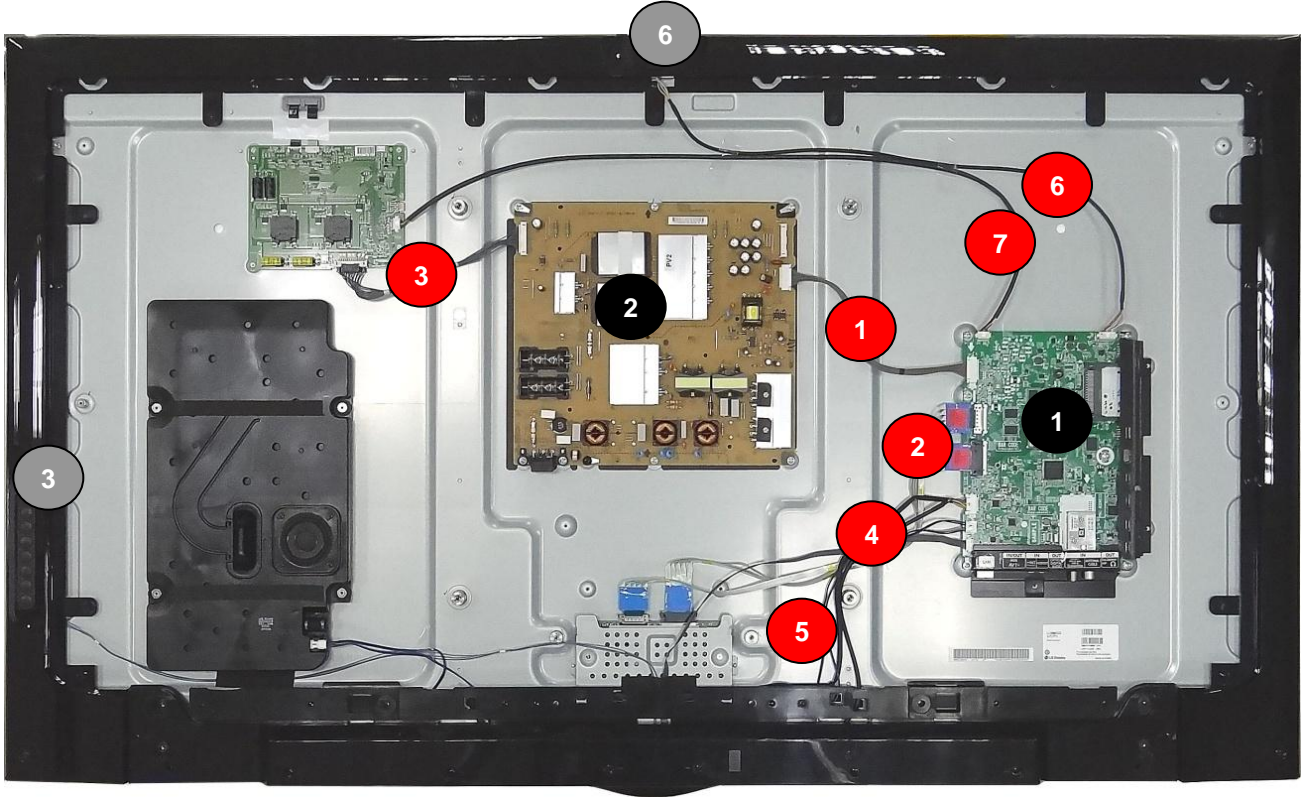
## [Cables]

7 IR to Local Key 3Pin Cable

8 IR cable

# Interconnection - 1

60LA860V-ZA



## [PCBs]

- 1 Main PCB
- 2 Power Board
- 3 Local key Assy
- 4 RF Assy
- 5 WIFI Assy
- 6 Camera Assy

## [Cables]

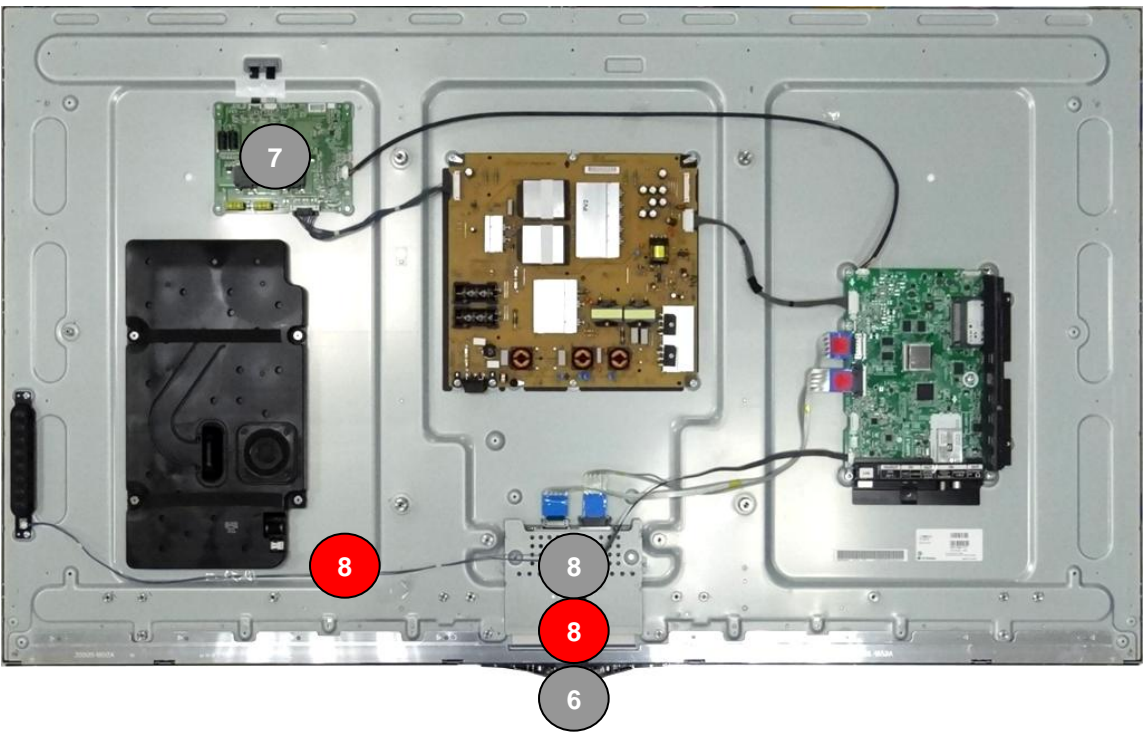
- 1 Main / PSU 18Pin
- 2 Main / T-con LVDS Cable 41& 51Pin
- 3 LED driver 14 Pin cable
- 4 WiFi 6Pin + RF 8Pin Cable
- 5 SPK Cable
- 6 Camera Cable
- 7 Local Dimming cable





# Interconnection - 2

60LA860V-ZA



## [PCBs]

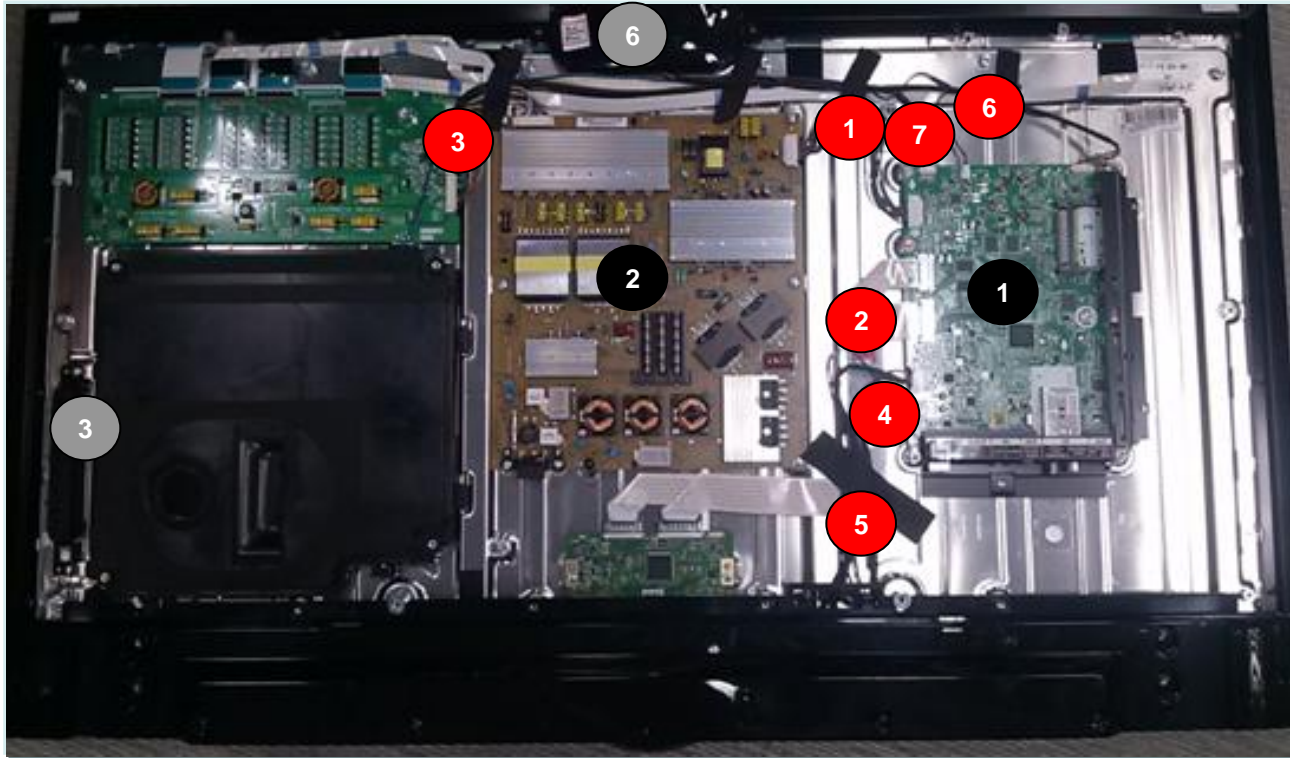
- 6 IR Assy
- 7 LED Driver
- 8 T-con

## [Cables]

- 8 IR to Local Key 3Pin Cable
- 9 IR 8 Pin Cable

# Interconnection - 1

47LA960V-ZA



## [PCBs]

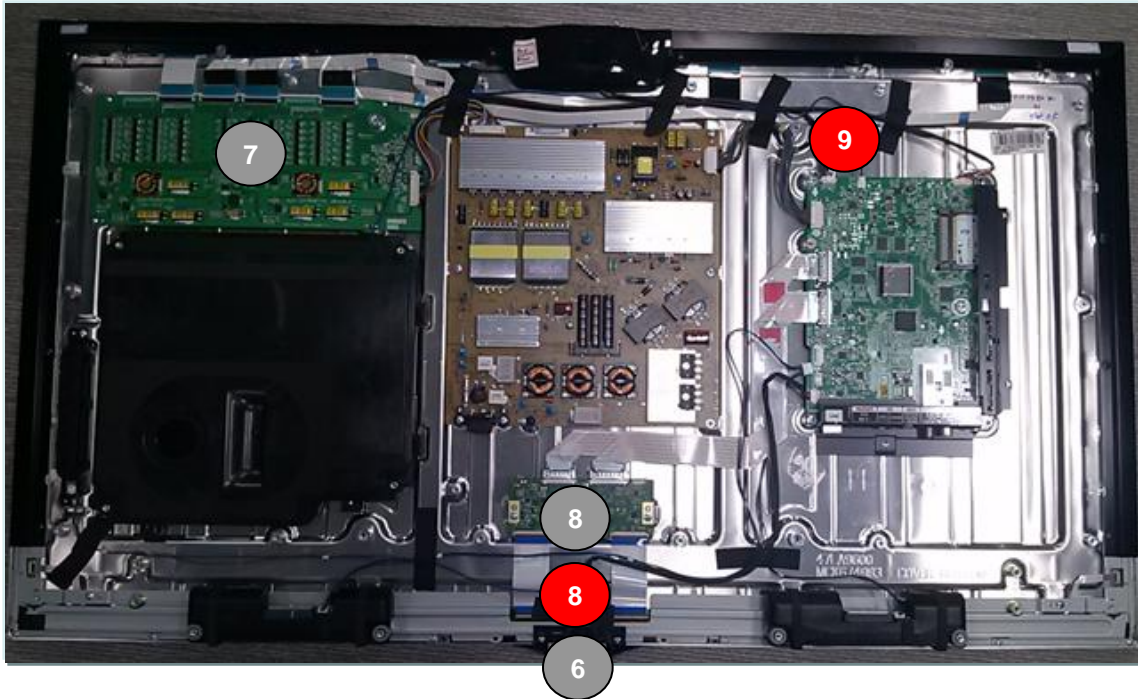
- 1 Main PCB
- 2 Power Board
- 3 Local key Assy
- 4 RF Assy
- 5 WIFI Assy
- 6 Camera Assy

## [Cables]

- 1 Main / PSU 18Pin
- 2 Main / T-con LVDS Cable 41& 51Pin
- 3 LED driver 14 Pin Cable
- 4 WiFi 6Pin + RF 8Pin Cable
- 5 SPK Cable
- 6 Camera Cable
- 7 Local Dimming cable

# Interconnection - 2

47LA960V-ZA



## [PCBs]

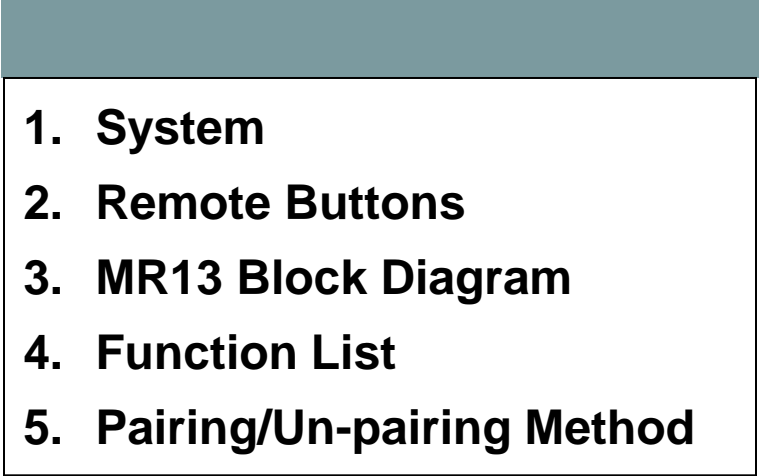
- 6 IR Assy
- 7 LED Driver
- 8 T-con

## [Cables]

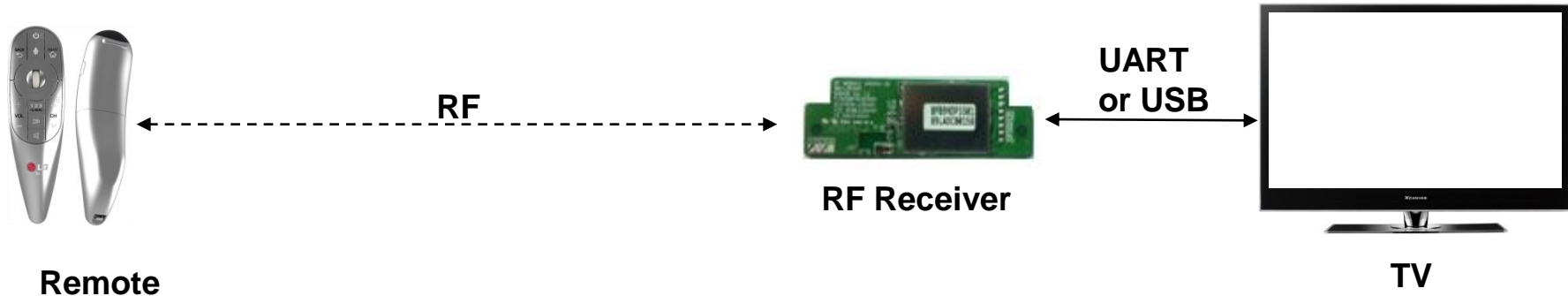
- 8 IR 5 Pin + Local Key 3 Pin Cable
- 9 Woofer Cable

## **Introductions of 13Y RF ass'y + Magic Remote control**

---

- 
- 1. System**
  - 2. Remote Buttons**
  - 3. MR13 Block Diagram**
  - 4. Function List**
  - 5. Pairing/Un-pairing Method**

# 1. System



## ❖ **Pairing Information Transmission (Send to TV after Paired)**

- Static Calibration Data (Bypass only)
- Remote FW ver. (Save also in Receiver)
- BD\_ADDR (Save also in Receiver)

## • **Pairing Information Transmission Sequence**

- When it is paired, the remote sends packets(pairing success, F/W version, BD\_ADDR) to the receiver.
- The receiver sends the pairing success packet to TV directly.
- F/W version and BD\_ADDR packets are just saved on the receiver.
- The receiver sends F/W version or BD\_ADDR packet to TV when it is required.

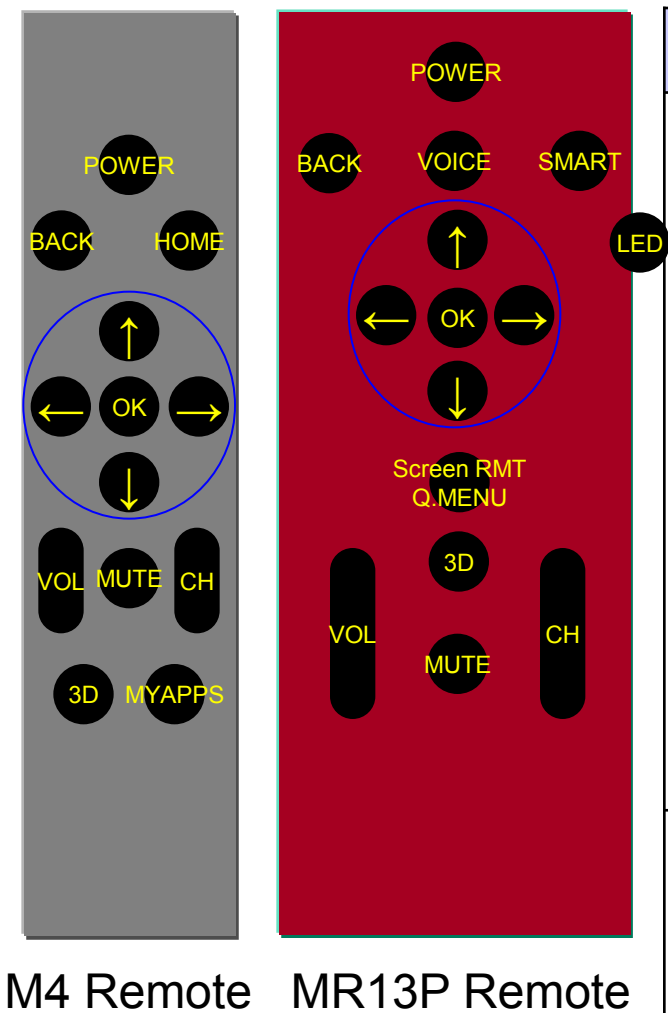
## ❖ **Motion Data Transmission**

- Period : 7.5msec
- Motion Data : gyro, accelerometer

## ❖ **Voice Data Transmission**

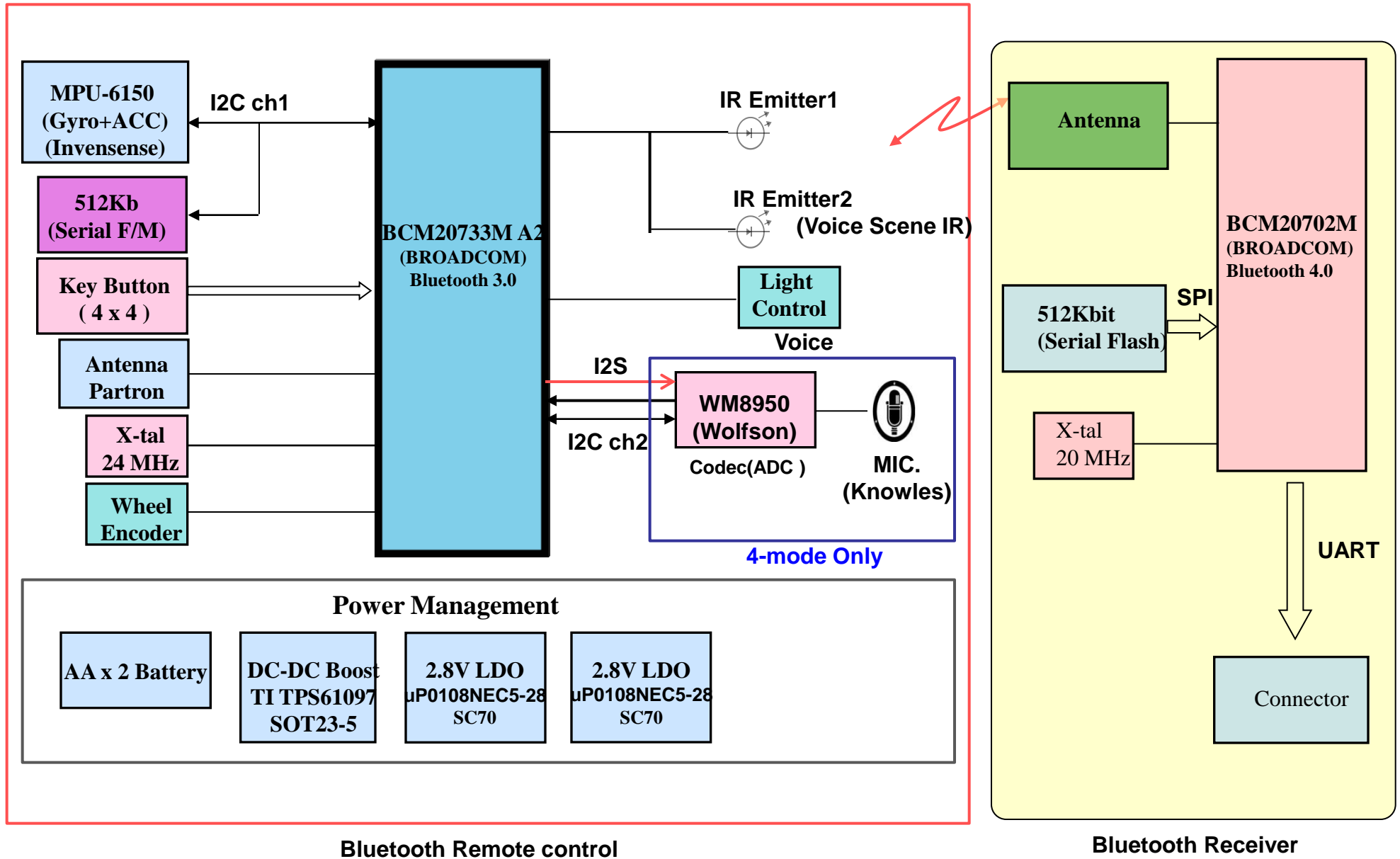
- Period : 10msec
- Voice sampling : 16khz 16bit

## 2. Remote Buttons (M4 vs. MR13P)



| BUTTON              |                        | RF Unpaired<br>IR_CODE | RF Paired<br>RF_CODE | IR continuous<br>repeat | ETC.          |
|---------------------|------------------------|------------------------|----------------------|-------------------------|---------------|
| Phisical<br>Buttons | POWER                  | 0x08                   | NONE                 | Y                       | IR only       |
|                     | BACK                   | 0x28                   | 0x8028               | Y                       |               |
|                     | SMART                  | 0x7C                   | 0x807C               | Y                       |               |
|                     | ←                      | 0x07                   | 0x8007               | Y                       |               |
|                     | →                      | 0x06                   | 0x8006               | Y                       |               |
|                     | ↑                      | 0x40                   | 0x8040               | Y                       |               |
|                     | ↓                      | 0x41                   | 0x8041               | Y                       |               |
|                     | OK                     | 0x75                   | 0x8044               | Y                       |               |
|                     | VOICE                  | 0xDE                   | 0x808B               | Y                       | = VOICE_START |
|                     | 3D                     | 0xDC                   | 0x80DC               | Y                       |               |
|                     | Screen RMT<br>/ Q.MENU | 0xDE                   | 0x80DE               | Y                       |               |
|                     | CH +                   | 0x00                   | 0x8000               | Y                       |               |
|                     | CH -                   | 0x01                   | 0x8001               | Y                       |               |
|                     | VOL +                  | 0x02                   | 0x8002               | Y                       |               |
|                     | VOL -                  | 0x03                   | 0x8003               | Y                       |               |
|                     | MUTE                   | 0x09                   | 0x8009               | Y                       |               |
| Logical<br>Buttons  | AUTO_WAKEUP            | X                      | 0x800C               |                         |               |
|                     | VOICE_START            | X                      | 0x800A               |                         |               |
|                     | VOICE_STOP             | X                      | 0x800D               |                         |               |
|                     | POINT_START            | X                      | 0x803E               |                         |               |
|                     | POINT_STOP             | X                      | 0x803F               |                         |               |

### 3. MR13P Block Diagram



## 4. Function list

| 주요 Item |                 |                             | IC            | Manufacturer | Function                                 |
|---------|-----------------|-----------------------------|---------------|--------------|------------------------------------------|
| Remocon | Voice           | Voice Codec                 | WM8950        | Wolfson      | 16KHz Sampling of Audio data             |
|         |                 | MEMS Mic.                   | SPU0414HR5H   | Knowles      | Sensing Voice                            |
|         | Motion Sensor   | Gyro Sensor + Accelerometer | MPU-6150      | Invensense   | Sensing angular velocity of X, Y, Z-axis |
|         |                 |                             |               |              | Sensing device tilt (Pitch & Roll angle) |
|         | RF + Micom      | RF Antenna                  | SDBTPTR3015   | Partron      | Wireless communication                   |
|         |                 | X-tal                       | 24MHz         | Partron      |                                          |
|         |                 | RF + Micom                  | BCM20733A2    | Broadcom     |                                          |
|         | DC-DC Converter |                             | TPS61097      | TI           | Battery Boost up Regulator               |
|         | LDO1            |                             | uP0108NEC5-28 | uPI          | RF, Gyro, Accelerometer Power Supply     |
|         | LDO2            |                             | uP0108NEC5-28 | uPI          | Audio Codec, Mic. Power Supply           |



## 5. RF Pairing / Un-pairing Method

|              | Method                                                                                                                                                                                                                                                                                                                 | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| RF Pairing   | <ul style="list-style-type: none"><li>❖ Method1<ul style="list-style-type: none"><li>– If unpaired, just press "OK" button.</li><li>– If paired, press "OK" button after unpairing.</li></ul></li><li>❖ Method 2 (Repairing)<ul style="list-style-type: none"><li>– Press "BACK" button for 5 sec.</li></ul></li></ul> | <ul style="list-style-type: none"><li>• When do pairing, the remote should make pairing request IR signal(0x75) to TV.</li><li>• When TV receive the IR signal, it should send "pairing request packet" to the RF receiver.</li><li>• After pairing success, the remote should blink LED for some time and TV send "pairing success packet" back to TV.</li><li>• When remote try to unpairing, it doesn't care about state of receiver(stand alone).</li></ul> |
| RF Unpairing | Press "BACK" button and "SMART" button at the same time for 5 sec.                                                                                                                                                                                                                                                     | <ul style="list-style-type: none"><li>• When remote try to unpairing, it doesn't care about state of receiver(stand alone).</li><li>• After unpairing, all pairing information should be erased.</li><li>• After unpairing, LED should be blinked for 3sec.</li><li>• The remote just becomes to IR mode.</li></ul>                                                                                                                                             |

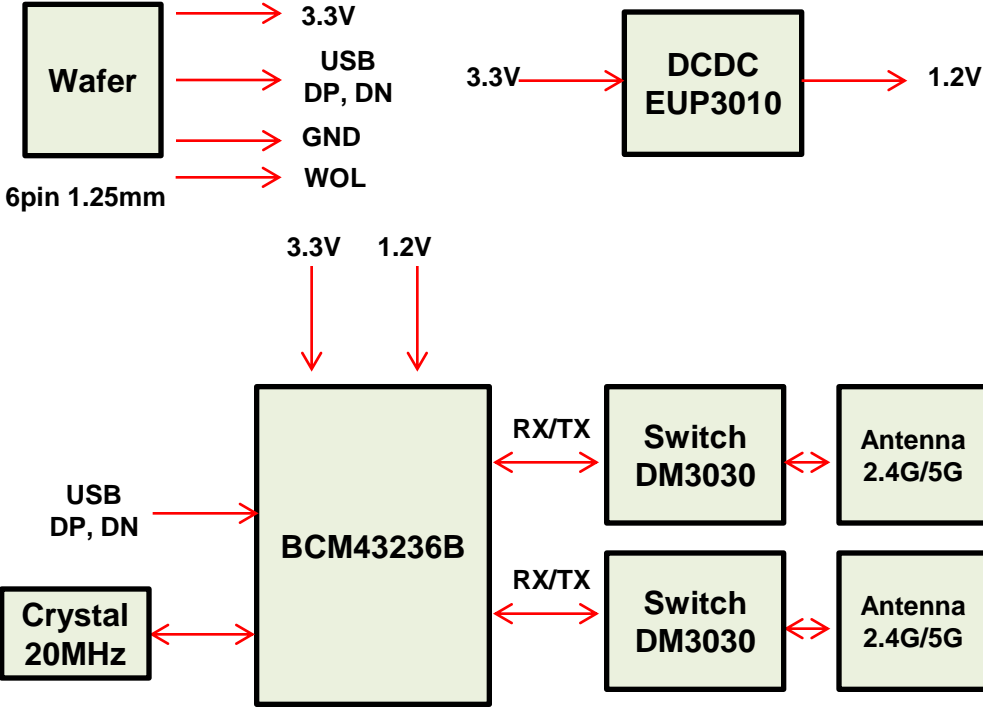
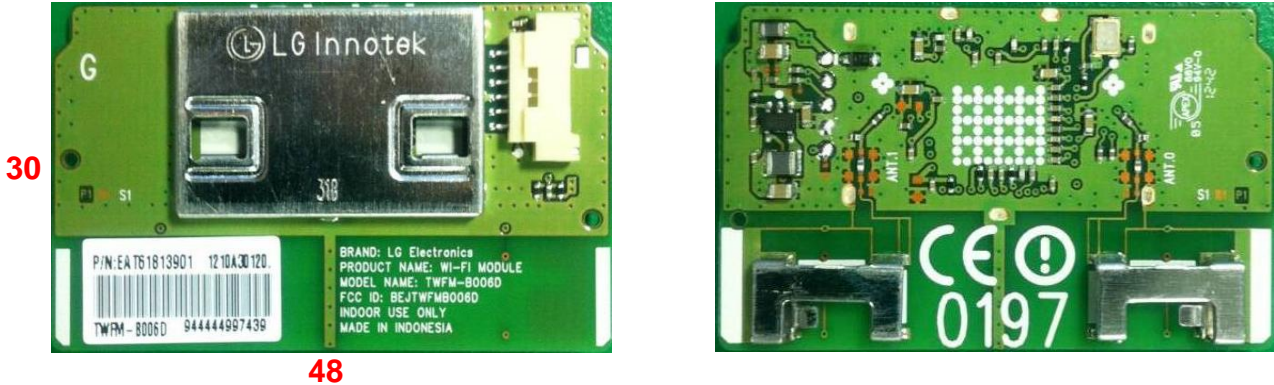
## **Introductions of 13Y WIFI built in ass'y**

---

- 
- 1. Wi-Fi built in Ass'y feature**
  - 2. Wi-Fi built in Ass'y specification**

# WIFI Built in ass'y feature

## Block diagram



### - Pin map

| PIN | USB interface |
|-----|---------------|
| 1   | Vcc           |
| 2   | DM            |
| 3   | DP            |
| 4   | GND           |
| 5   | WOW           |
| 6   | NC            |

# WIFI Built in ass'y Specification

- ◆ Frequency Band:

Draft 802.11n Radio: 2.4 GHz

802.11g Radio: 2.4 GHz

802.11b Radio: 2.4 GHz

USA – FCC

2412~2462MHz (Ch1~Ch11)

Canada – IC

2412~2462MHz (Ch1~Ch11)

Europe – ETSI

2412~2472MHz (Ch1~Ch13)

Japan – STD-T66/STD-33

2412~2484MHz (Ch1~Ch14)

802.11a Radio : 5 GHz

5.150~5.250GHz

5.725~5.850GHz

- ◆ Operating Channels:

IEEE 802.11b/g/n compliant:

11 channels (US, Canada)

13 channels (ETSI)

14 channels (Japan)

- ◆ Transmit Power and Sensitivity:

TX Output Power:(Typical) (Meet emission standard)

11b 17 +/- 2 dBm

11g 14 +/- 2 dBm@54Mbps (Each chain)

11n 13 +/- 2 dBm (Each chain)

Rx Sensitivity:(Typical)

-69dBm at HT20 m7 2.4GHz

-87dBm at HT20 m0 2.4GHz

-69dBm at HT20 m7 5.0GHz

-87dBm at HT20 m0 5.0GHz

- ◆ Modulation

DBPSK @1Mbps

DQPSK@2Mbps

CCK@5.5/11Mbps

BPSK@6/9 Mbps

QPSK@12/18Mbps

16-QAM@24Mbps

64-QAM@48/54Mbps and above

- ◆ Current consumption(5V DC):

Full load: 430mA

- ◆ Operating Temperature: 0 ~ 60 °C ambient

- ◆ Storage Temperature: -20 ~ 60 °C ambient

- ◆ Humidity: under 85% and must be non-condensing

- ◆ Regulation and certification compliance available:

- ◆ CE

- ◆ FCC

- ◆ WiFi



- ◆ WPS



# Contents of LCD TV Standard Repair Process

| No. | Error symptom (High category) | Error symptom (Mid category)                                                     | Page | Remarks |
|-----|-------------------------------|----------------------------------------------------------------------------------|------|---------|
| 1   | A. Video error                | No video/Normal audio                                                            | 1    |         |
| 2   |                               | No video/No audio                                                                | 2    |         |
| 3   |                               | Video error, video lag/stop, fail tuning                                         | 3, 4 |         |
| 4   |                               | Color error                                                                      | 5    |         |
| 5   |                               | Vertical/Horizontal bar, residual image, light spot, external device color error | 6    |         |
| 6   | B. Power error                | No power                                                                         | 7    |         |
| 7   |                               | Off when on, off while viewing, power auto on/off                                | 8    |         |
| 8   | C. Audio error                | No audio/Normal video                                                            | 9    |         |
| 9   |                               | Wrecked audio/discontinuation/noise                                              | 10   |         |
| 10  | D. Function error             | No response in remote controller, key error, recording error, memory error       | 11   |         |
| 11  |                               | External device recognition error                                                | 12   |         |
| 12  | E. Noise                      | Circuit noise, mechanical noise                                                  | 13   |         |
| 13  | F. Exterior error             | Exterior defect                                                                  | 14   |         |
| 14  | G. Network error              | Connection defect / Network speed low                                            | 15   |         |

**First of all, Check whether there is SVC Bulletin in GCSC System for these model.**

# Contents of LCD TV Standard Repair Process Detail Technical Manual

| No. | Error symptom                                                                 | Content                                        | Page       | Remarks                              |
|-----|-------------------------------------------------------------------------------|------------------------------------------------|------------|--------------------------------------|
| 1   | A. Video error_ No video/Normal audio                                         | Check LCD back light with naked eye            | A1         |                                      |
| 2   |                                                                               | LED driver B+ 24V measuring method             | A2         |                                      |
| 3   |                                                                               | Check White Balance value                      | A3         |                                      |
| 4   |                                                                               | Power Board voltage measuring method           | A4         |                                      |
| 6   | A. Video error_ No video/Video lag/stop                                       | TUNER input signal strength checking method    | A6         |                                      |
| 7   |                                                                               | LCD-TV Version checking method                 | A7         |                                      |
| 9   | A. Video error_Color error                                                    | LCD TV connection diagram                      | A8         |                                      |
| 10  |                                                                               | Tuner Checking Part                            | A9         |                                      |
| 11  |                                                                               | Check Link Cable (LVDS) reconnection condition | A10<br>A11 | A10 : 32/37/42/47/55<br>A11 : 32 AUO |
| 12  |                                                                               | Adjustment Test pattern – ADJ Key              | A12        |                                      |
| 13  | A. Video error_Vertical/Horizontal bar, residual image, light spot            | LCD TV connection diagram                      | A8         |                                      |
| 14  |                                                                               | Check Link Cable (LVDS) reconnection condition | A10<br>A11 | A10 : 32/37/42/47/55<br>A11 : 32 AUO |
| 15  |                                                                               | Adjustment Test pattern – ADJ Key              | A12        |                                      |
| 16  | <b>&lt;Appendix&gt;</b><br>Defected Type caused by T-Con/<br>Inverter/ Module | Exchange T-Con Board (1)                       | A-1/5      |                                      |
| 17  |                                                                               | Exchange T-Con Board (2)                       | A-2/5      |                                      |
| 18  |                                                                               | Exchange LED driver Board (PSU)                | A-3/5      | 55" : driver board<br>Other : PSU    |
| 19  |                                                                               | Exchange Module itself (1)                     | A-4/5      |                                      |
| 20  |                                                                               | Exchange Module itself (2)                     | A-5/5      |                                      |

Continue to the next page

# Standard Repair Process

LCD TV

Error symptom

A. Video error

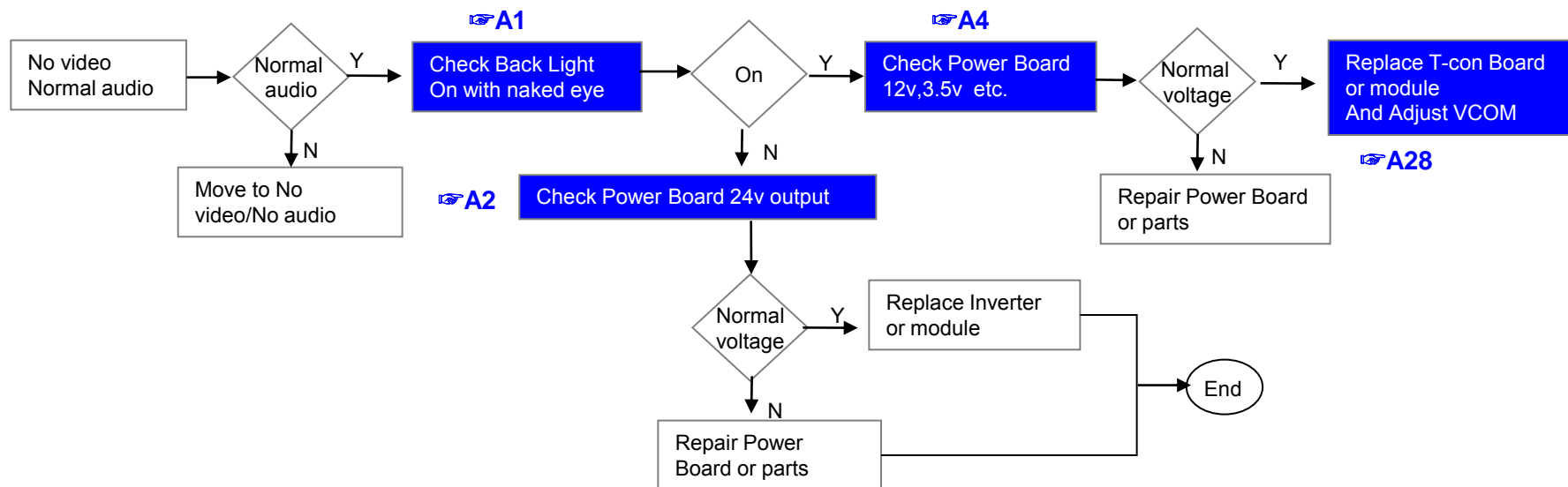
Established date

2012. 12 .06

No video/ Normal audio

Revised date

**First of all, Check whether all of cables between board is inserted properly or not.**  
(Main B/D↔ Power B/D, LVDS Cable,Speaker Cable,IR B/D Cable,,,) )



※Precaution A7 & A3

Always check & record S/W Version and White Balance value before replacing the Main Board

Replace Main Board

Re-enter White Balance value

Standard Repair Process

LCD TV

Error  
symptom

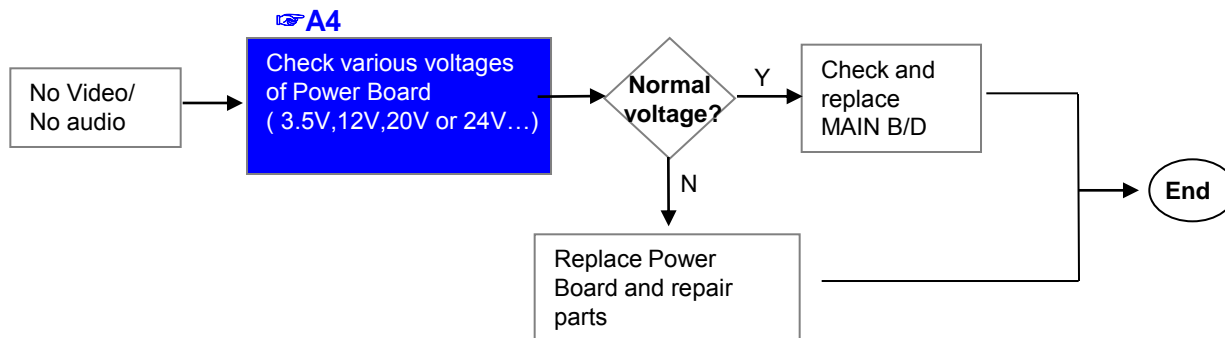
A. Video error

Established  
date

2012. 12 .06

No video/ No audio

Revised date





# Standard Repair Process

LCD TV

Error symptom

## A. Picture Problem

Established date

2012. 12 .06

Picture broken/ Freezing

Revised date

**A6**

**Check RF Signal level**

- . By using Digital signal level meter
- . By using Diagnostics menu on OSD  
( Menu→ Set up→ Support → Signal Test )
- Signal strength (Normal : over 50%)
- Signal Quality (Normal: over 50%)

Normal Signal?

Y

Check whether other equipments have problem or not.  
(By connecting RF Cable at other equipment)  
→ DVD Player ,Set-Top-Box, Different maker TV etc`

N

Check RF Cable Connection  
1. Reconnection  
2. Install Booster

Normal Picture?

N

Contact with signal distributor or broadcaster (Cable or Air)

Y

Close

**A7**

**Check S/W Version**

Normal Picture?

Y

SVC Bulletin?

N

Use Signal Test Check Signal status

Normal Picture?

Y

Close

S/W Upgrade

Normal Picture?

N

Close

Check Tuner soldering

Replace Main B/D

# Standard Repair Process

LCD TV

Error symptom

A. Picture Problem (DVB-S/S2)

Established date

2012. 12 .06

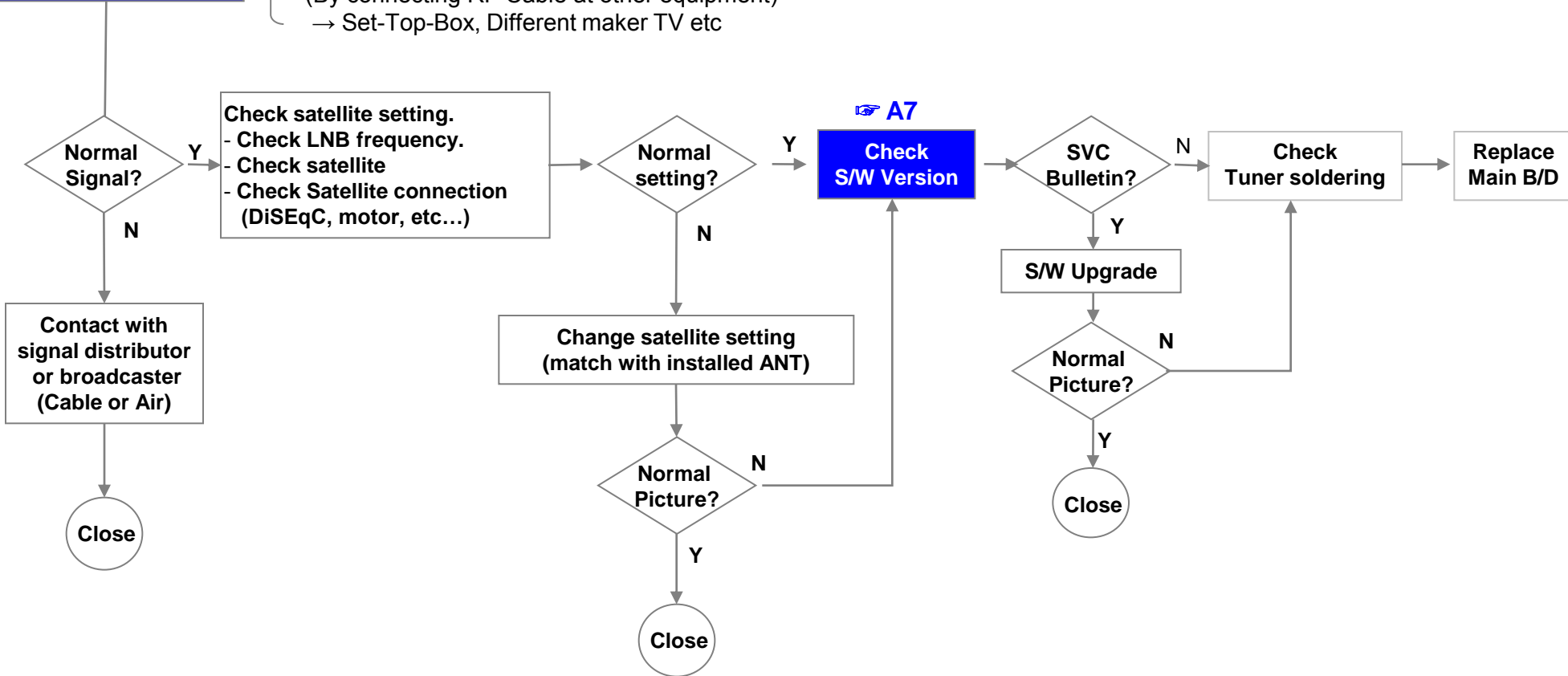
Tuning fail, Picture broken/ Freezing

Revised date

👉 A6

Check RF Signal level

Check RF signal cable (DVB satellite signal or not)  
Check whether other equipments have problem or not.  
(By connecting RF Cable at other equipment)  
→ Set-Top-Box, Different maker TV etc



# Standard Repair Process

LCD TV

Error symptom

A. Video error

Established date

2012. 12 .06

Color error

Revised date

A8

Check color by input  
-External Input  
-COMPONENT  
-RGB  
-HDMI/DVI

Color error?

A10/ A11

※ Check and replace Link Cable (LVDS) and contact condition

Color error?

Replace Main B/D

Color error?

Replace module

Check error color input mode

End

A12

Check Test pattern

External Input/  
Component error

Check external device and cable

External device /Cable normal

Replace Main B/D

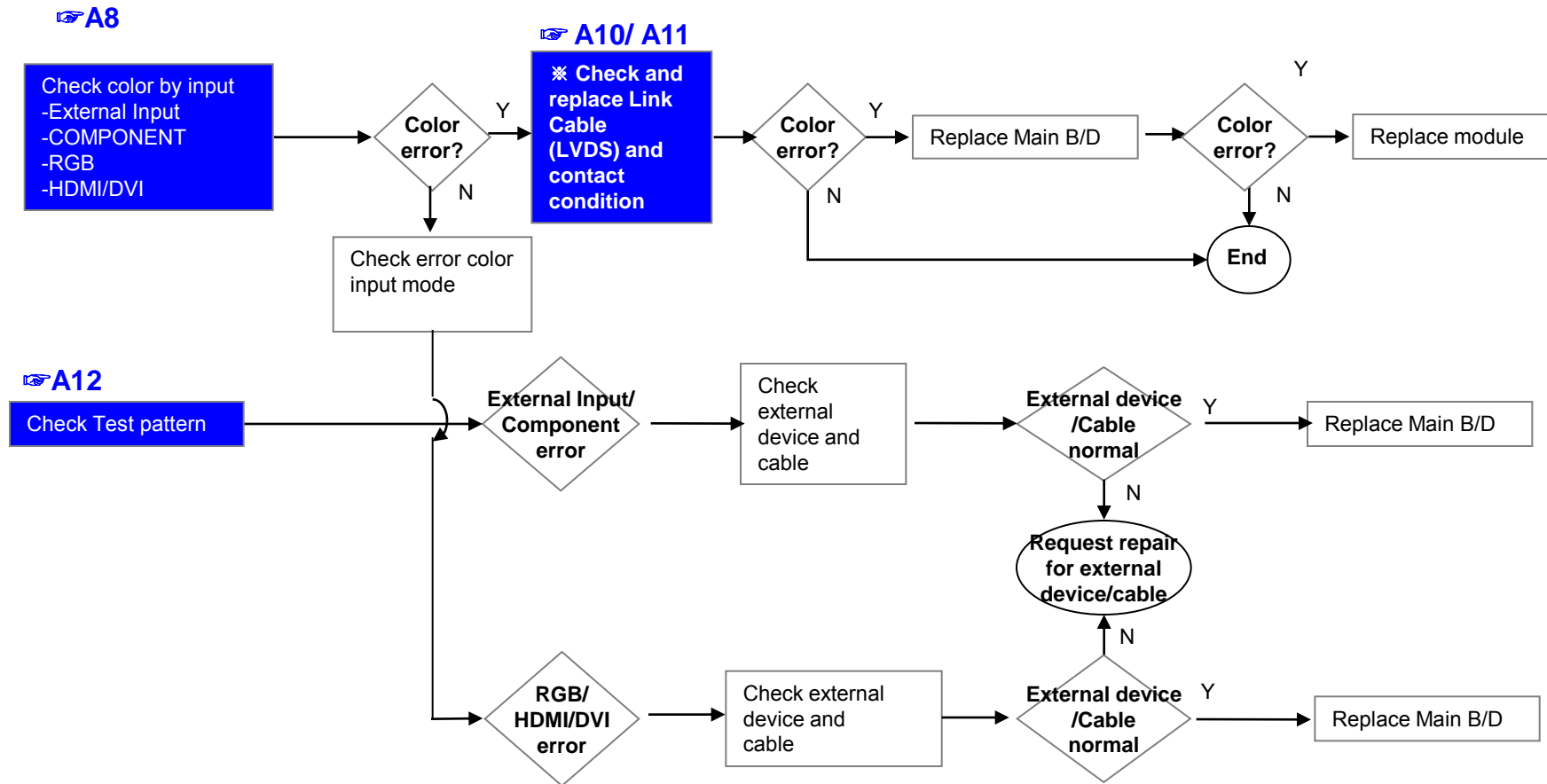
Request repair for external device/cable

RGB/  
HDMI/DVI error

Check external device and cable

External device /Cable normal

Replace Main B/D



# Standard Repair Process

LCD TV

Error symptom

## A. Video error

Established date

2012. 12 .06

Vertical / Horizontal bar, residual image, light spot, external device color error

Revised date

Vertical/Horizontal bar, residual image, light spot

**A8**

Check color condition by input  
-External Input  
-Component  
-RGB  
-HDMI/DVI

Screen normal?

Replace module

Check external device connection condition

Normal?

Request repair for external device

**A10/ A11**

Check and replace Link Cable

Screen normal?

End

**A28**

Replace Main B/D (adjust VCOM)

For LGD panel

For other panel

Replace Module

Screen normal?

End

**A12**

Check Test pattern

External device screen error-Color error

Check S/W Version

Check version

S/W Upgrade

Normal screen?

End

Check screen condition by input  
-External Input  
-Component  
-RGB  
-HDMI/DVI

External Input error

Component error

RGB error

HDMI/DVI

Connect other external device and cable  
(Check normal operation of External Input, Component, RGB and HDMI/DVI by connecting Jig, pattern Generator, Set-top Box etc.)

Connect other external device and cable  
(Check normal operation of External Input, Component, RGB and HDMI/DVI by connecting Jig, pattern Generator, Set-top Box etc.)

Screen normal?

Replace Main B/D

Request repair for external device

Screen normal?

Replace Main B/D

# Standard Repair Process

LCD TV

Error symptom

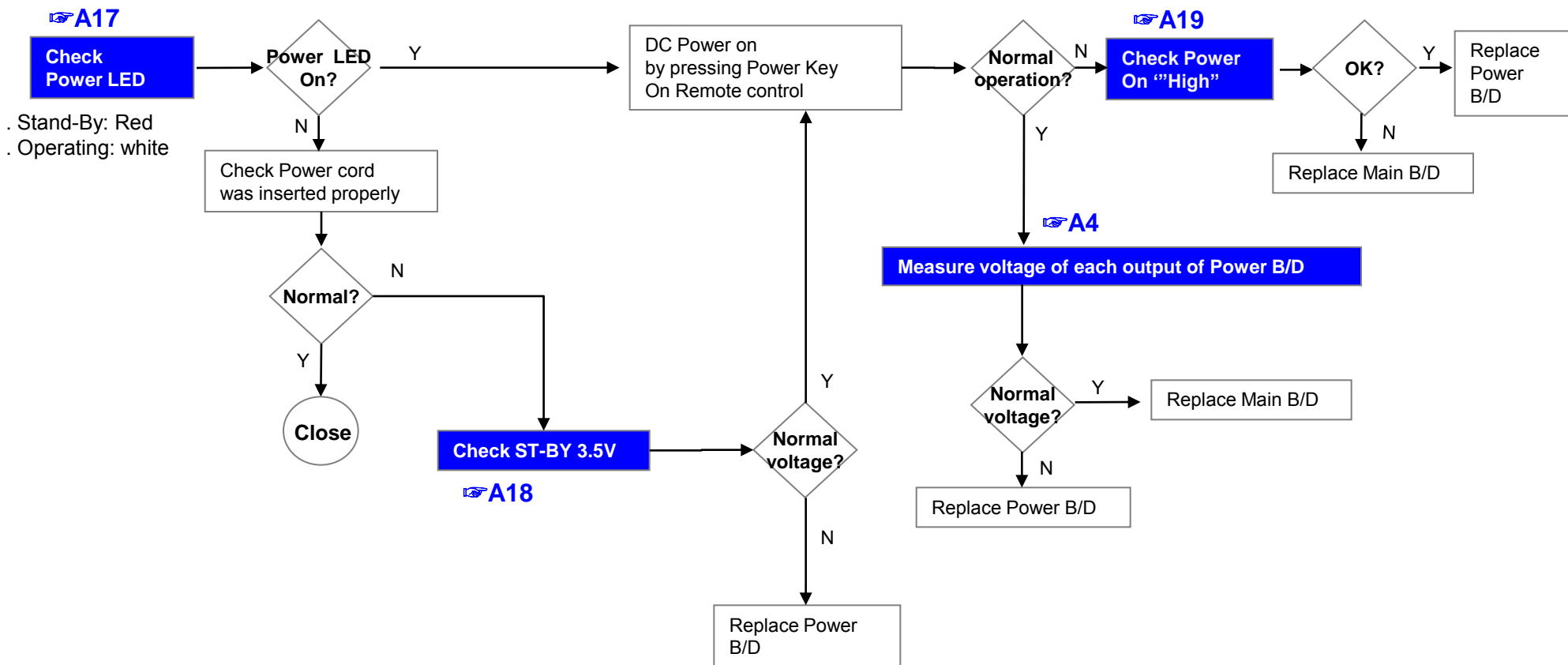
B. Power error

Established date

2012. 12 .06

No power

Revised date



# Standard Repair Process

LCD TV

Error symptom

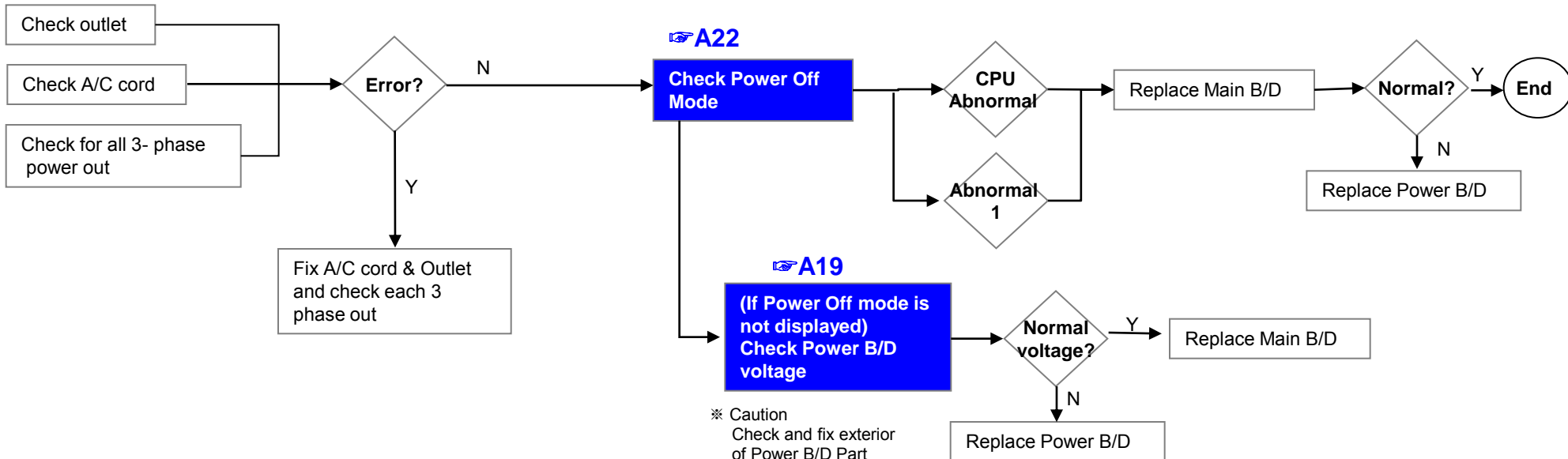
B. Power error

Established date

2012. 12 .06

Off when on, off while viewing, power auto on/off

Revised date



\* Please refer to the all cases which can be displayed on power off mode.

| Status   | Power off List         | Explanation                                     |
|----------|------------------------|-------------------------------------------------|
| Normal   | "POWEROFF_REMOTEKEY"   | Power off by REMOTE CONTROL                     |
|          | "POWEROFF_OFFTIMER"    | Power off by OFF TIMER                          |
|          | "POWEROFF_SLEEPTIMER"  | Power off by SLEEP TIMER                        |
|          | "POWEROFF_INSTOP"      | Power off by INSTOP KEY                         |
|          | "POWEROFF_AUTOOFF"     | Power off by AUTO OFF                           |
|          | "POWEROFF_ONTIMER"     | Power off by ON TIMER                           |
|          | "POWEROFF_RS232C"      | Power off by RS232C                             |
|          | "POWEROFF_RESREC"      | Power off by Reserved Record                    |
|          | "POWEROFF_RECEND"      | Power off by End of Recording                   |
|          | "POWEROFF_SWDOWN"      | Power off by S/W Download                       |
|          | "POWEROFF_UNKNOWN"     | Power off by unknown status except listed case  |
| Abnormal | "POWEROFF_ABNORMAL1"   | Power off by abnormal status except CPU trouble |
|          | "POWEROFF_CPUABNORMAL" | Power off by CPU Abnormal                       |

Standard Repair Process

LCD TV

Error  
symptom

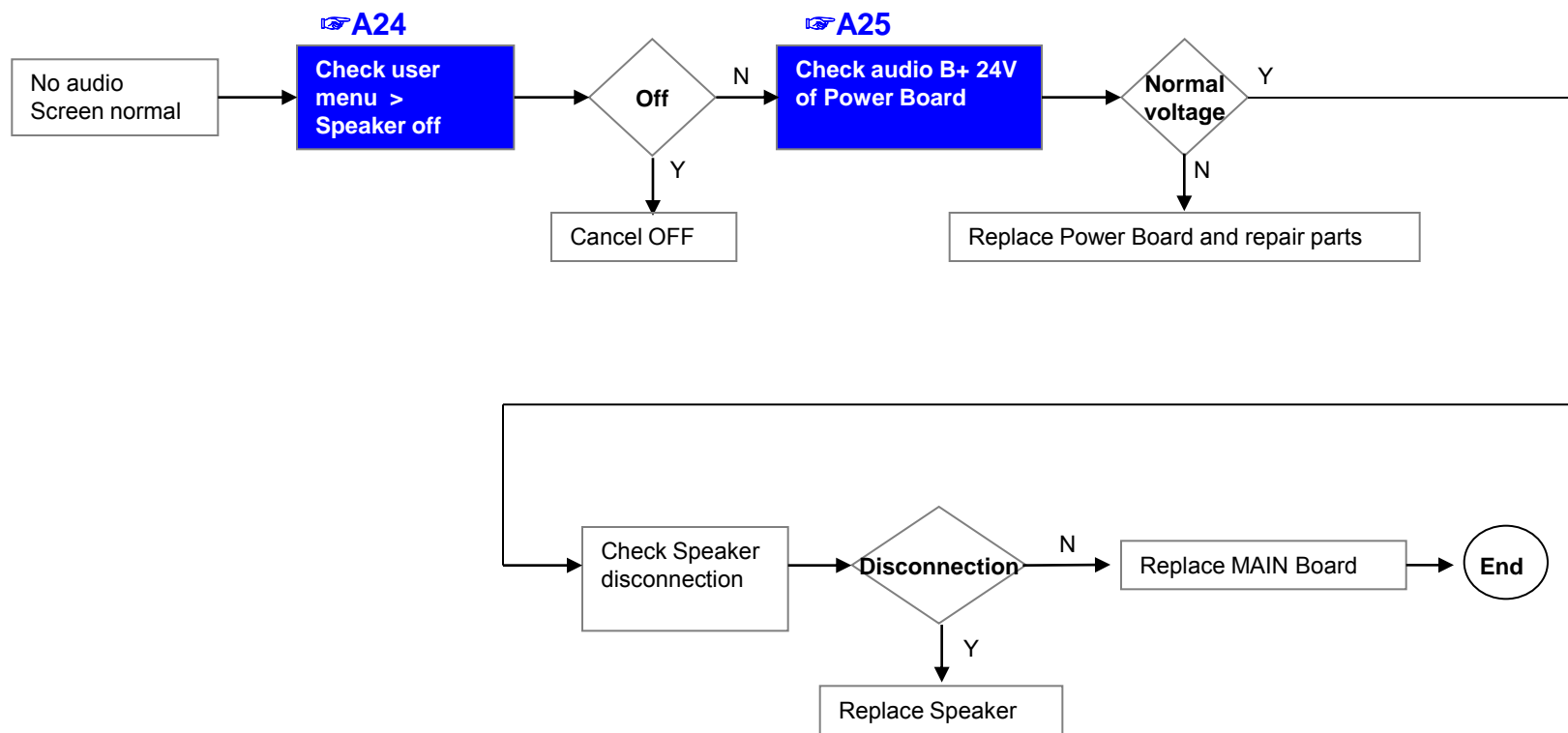
C. Audio error

Established  
date

2012. 12 .06

No audio/ Normal video

Revised date



# Standard Repair Process

LCD TV

Error symptom

C. Audio error

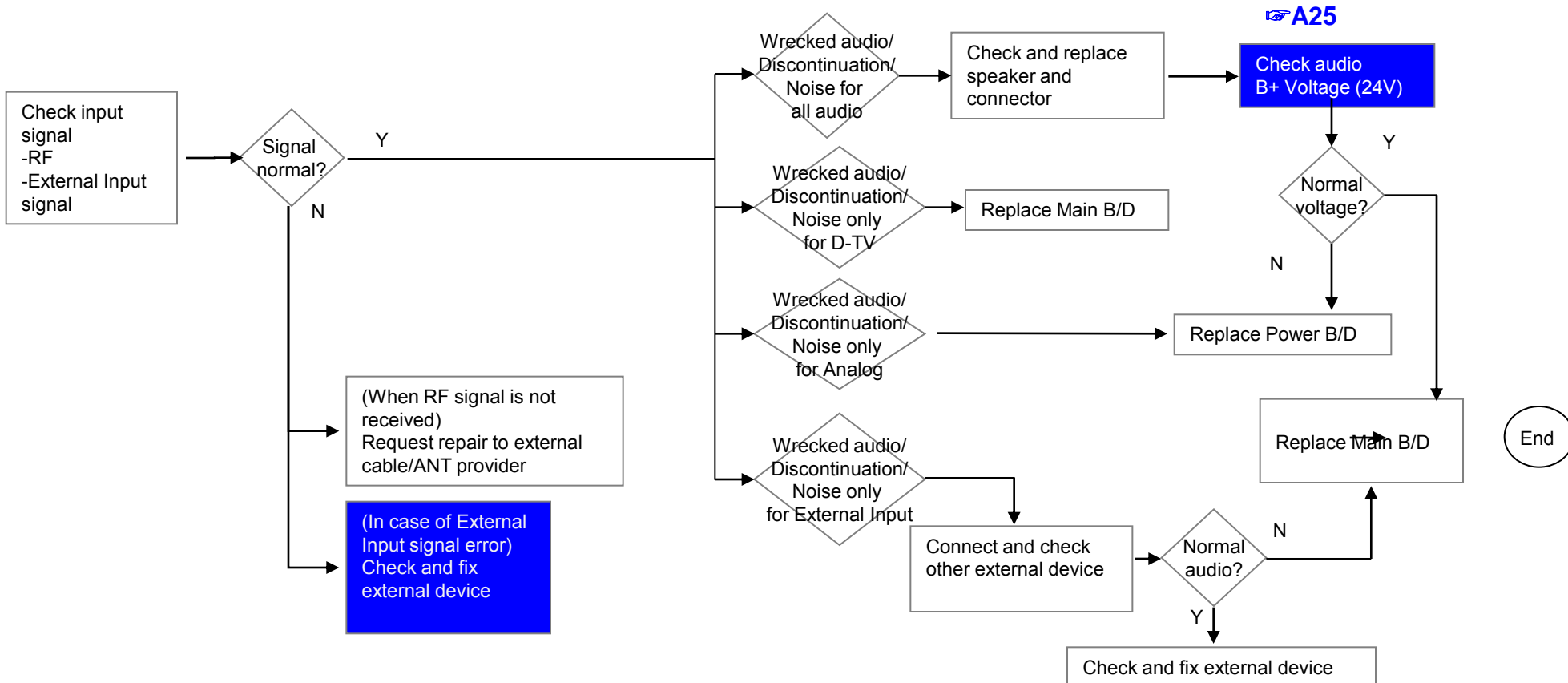
Established date

2012. 12 .06

Wrecked audio/ discontinuation/noise

Revised date

→ abnormal audio/discontinuation/noise is same after “Check input signal” compared to No audio





# Standard Repair Process

LCD TV

Error symptom

D. General Function Problem

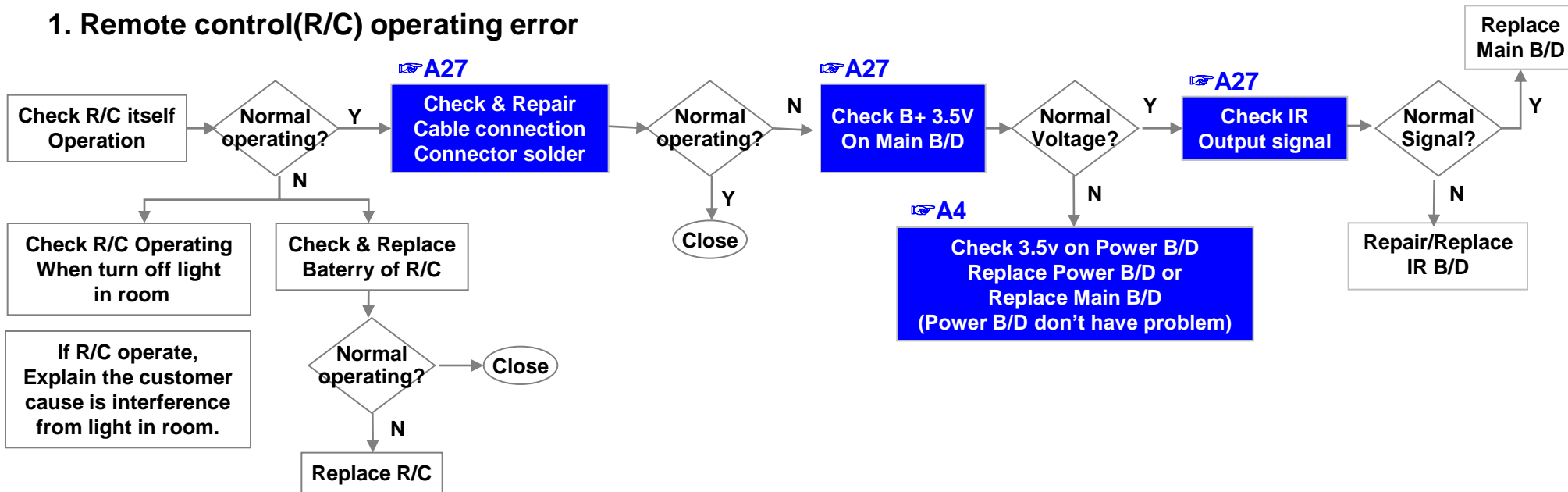
Established date

2012. 12 .06

Remote control & Local switch checking

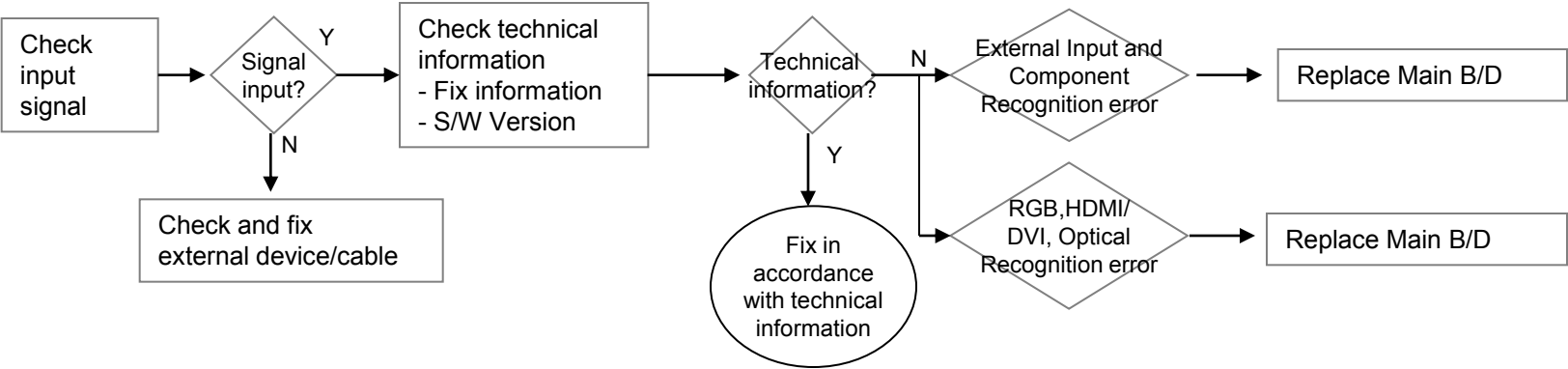
Revised date

## 1. Remote control(R/C) operating error



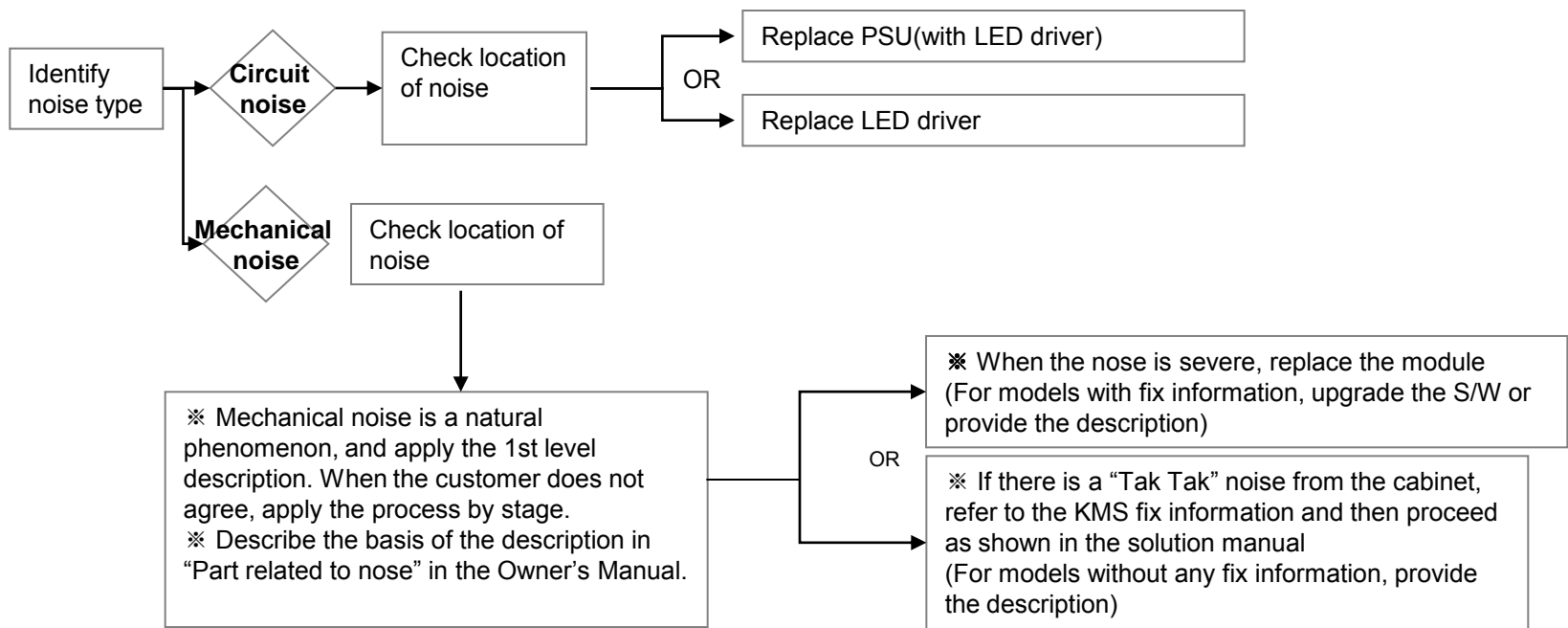
# Standard Repair Process

|        |               |                                   |                  |              |  |
|--------|---------------|-----------------------------------|------------------|--------------|--|
| LCD TV | Error symptom | D. Function error                 | Established date | 2012. 12 .06 |  |
|        |               | External device recognition error | Revised date     |              |  |



# Standard Repair Process

| LCD TV | Error symptom | E. Noise                        | Established date | 2012. 12 .06 |  |
|--------|---------------|---------------------------------|------------------|--------------|--|
|        |               | Circuit noise, mechanical noise | Revised date     |              |  |



Standard Repair Process

LCD TV

Error  
symptom

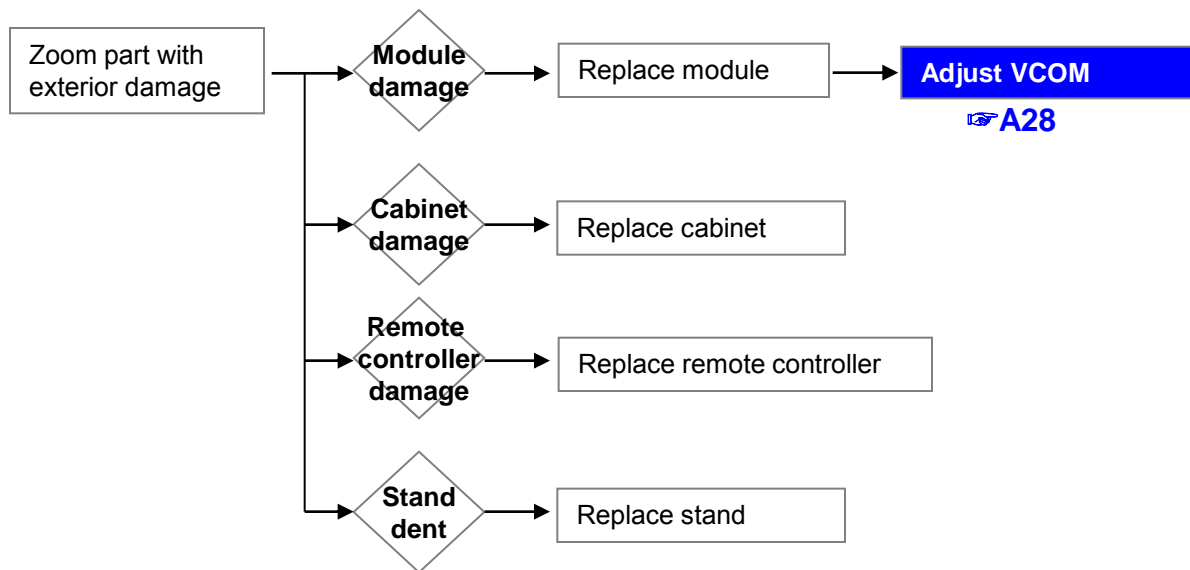
F. Exterior defect

Established  
date

2012. 12 .06

Exterior defect

Revised date



# Standard Repair Process

LCD TV

Error symptom

G. Network Error

Established date

2012. 12 .06

Exterior defect

Revised date

Check Network status

Check Wired ethernet cable connection  
Check whether AP has a problem or not.  
Setting → Network → Network Status

Normal Signal?

Y

N

Check connection with AP or internet  
(WiFi = AP)  
(Wired = ethernet port)

Close

Check Network connection  
Case1 WiFi .  
- Check AP status  
Case2 Wired  
- Check ethernet Port

Normal setting?

Y

N

Try to new network connection  
(match with AP and ether setting)

Normal Picture?

N

Y

Close

A7

Check S/W Version

SVC Bulletin?

N

Y

S/W Upgrade

Normal Picture?

N

Y

Close

Check Wired, Wifi status  
(Cable / sub Assy)

Replace Main B/D

# Standard Repair Process

LCD TV

Error symptom

G. CI+ Competibility Error

Established date

2012. 12 .06

Exterior defect

Revised date

Check defect CI slot pin  
Check it's worked CI+ 1.2 or 1.3  
Setting → Antenna → CI information

Check CI CAM status

Read Information?

Y

Check status of CI+ Key in the In-start menu

Is there CI+ key?

Y

Check CAM S/W Version

SVC Bulletin?

N

Check Wired, Wifi status (Cable / sub Assy)

Replace Main B/D

N

Check damage of CI slot pin  
Or damage of CI CAM

Close

N

Replace Main B/D  
Or  
Download CI+ Key

CAM S/W Upgrade By OTA

Normal Picture?

N

Close

Y

Old version of CI+ 1.2 CAM is not worked at the TV that is supported CI+ 1.3

→ Check SVC Bulletin

# Contents of LCD TV Standard Repair Process Detail Technical Manual

Continued from previous page

| No. | Error symptom                                                  | Content                                                    | Page | Remarks |
|-----|----------------------------------------------------------------|------------------------------------------------------------|------|---------|
| 21  | B. Power error_No power                                        | Check front display LED                                    | A17  |         |
| 22  |                                                                | Check power input Voltage & ST-BY 3.5V                     | A18  |         |
| 23  |                                                                | Checking method when power is ON                           | A19  |         |
| 24  |                                                                | POWER BOARD voltage measuring method                       | A5   |         |
| 25  |                                                                |                                                            |      |         |
| 26  | B. Power error_Off when on, off while viewing                  | POWER OFF MODE checking method                             | A22  |         |
| 27  | B. Power error_Off when on, off while viewing                  | POWER BOARD PIN voltage checking method                    | A19  |         |
| 28  | C. Audio error_No audio/Normal video                           | Checking method in menu when there is no audio             | A24  |         |
| 29  |                                                                | Voltage and speaker checking method when there is no audio | A25  |         |
| 30  | C. Audio error_Wrecked audio/discontinuation                   | Voltage and speaker checking method in case of audio error | A25  |         |
| 31  | D. Function error_ No response in remote controller, key error | Remote controller operation checking method                | A27  |         |
| 32  | D. VCOM Adjustment                                             | Sequence of the Vcom adjustment                            | A28  |         |

## Standard Repair Process Detail Technical Manual

LCD TV

Error  
symptom

A. Video error\_No video/Normal audio

Established  
date

2012. 12 .06

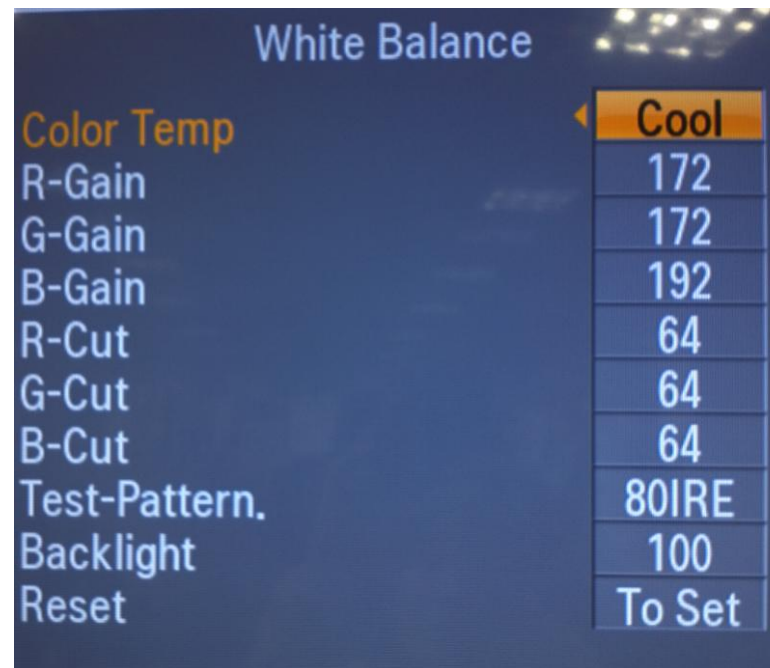
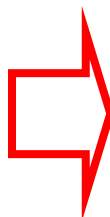
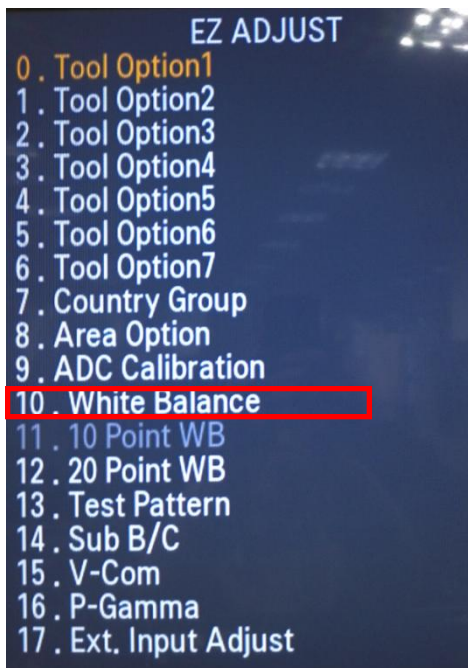
Content

Check White Balance value

Revised  
date

A4

<ALL MODELS>



### Entry method

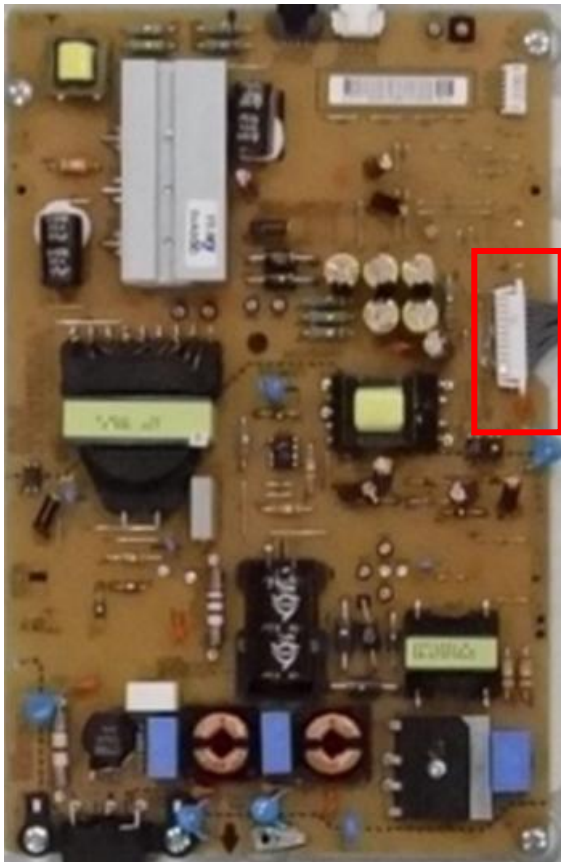
1. Press the ADJ button on the remote controller for adjustment.
2. Enter into White Balance of item 10.
3. After recording the R, G, B (GAIN, Cut) value of Color Temp (Cool/Medium/Warm), re-enter the value after replacing the MAIN BOARD.



Standard Repair Process Detail Technical Manual

|        |               |                                      |                  |              |    |
|--------|---------------|--------------------------------------|------------------|--------------|----|
| LCD TV | Error symptom | A. Video error_No video/ Audio       | Established date | 2012. 12 .06 |    |
|        | Content       | Power Board voltage measuring method | Revised date     |              | A5 |

Check the DC 24V, 12V, 3.5V.

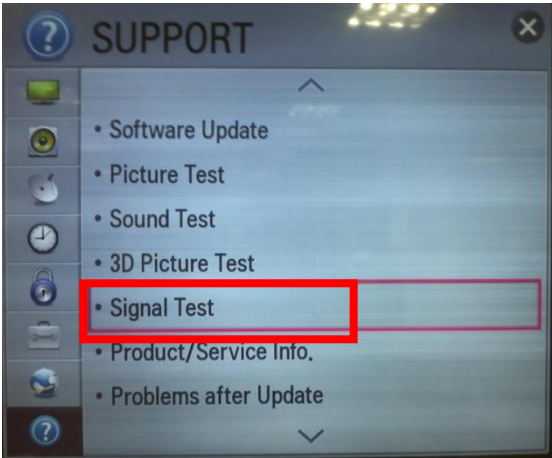


| 24 Pin (Power Board ↔ Main Board) |             |    |                 |
|-----------------------------------|-------------|----|-----------------|
| SMAW200-H24S                      |             |    |                 |
| 1                                 | Power on    | 2  | Inverter On/off |
| 3                                 | 3.5V        | 4  | PWM Dim #1      |
| 5                                 | 3.5V        | 6  | PWM Dim #2      |
| 7                                 | GND         | 8  | GND             |
| 9                                 | 24V         | 10 | 24V             |
| 11                                | GND         | 12 | GND             |
| 13                                | 12V         | 14 | 12V             |
| 15                                | 12V         | 16 | 24V             |
| 17                                | GND         | 18 | GND             |
| 19                                | GND         | 20 | GND             |
| 21                                | GND         | 22 | L/DIM0_VS       |
| 23                                | L/DIM0_MOSI | 24 | L/DIM0_SCLK     |

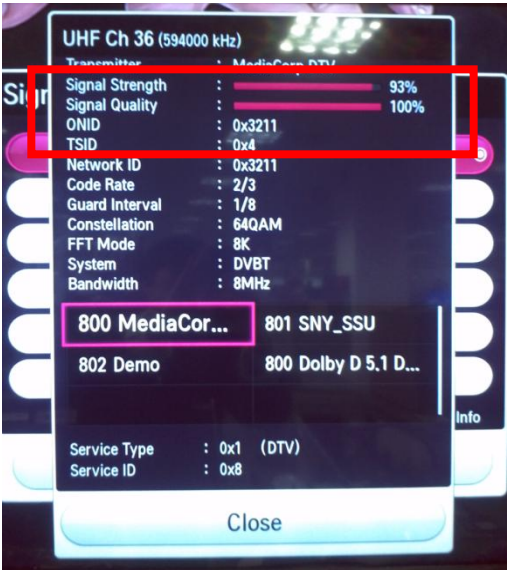
# Standard Repair Process Detail Technical Manual

|        |               |                                             |                  |              |    |
|--------|---------------|---------------------------------------------|------------------|--------------|----|
| LCD TV | Error symptom | A. Video error_Video error, video lag/stop  | Established date | 2012. 12 .06 |    |
|        | Content       | TUNER input signal strength checking method | Revised date     |              | A6 |

<ALL MODELS>



MENU → support → signal test  
→ select channel



When the signal is strong, use the attenuator (-10dB, -15dB, -20dB etc.)



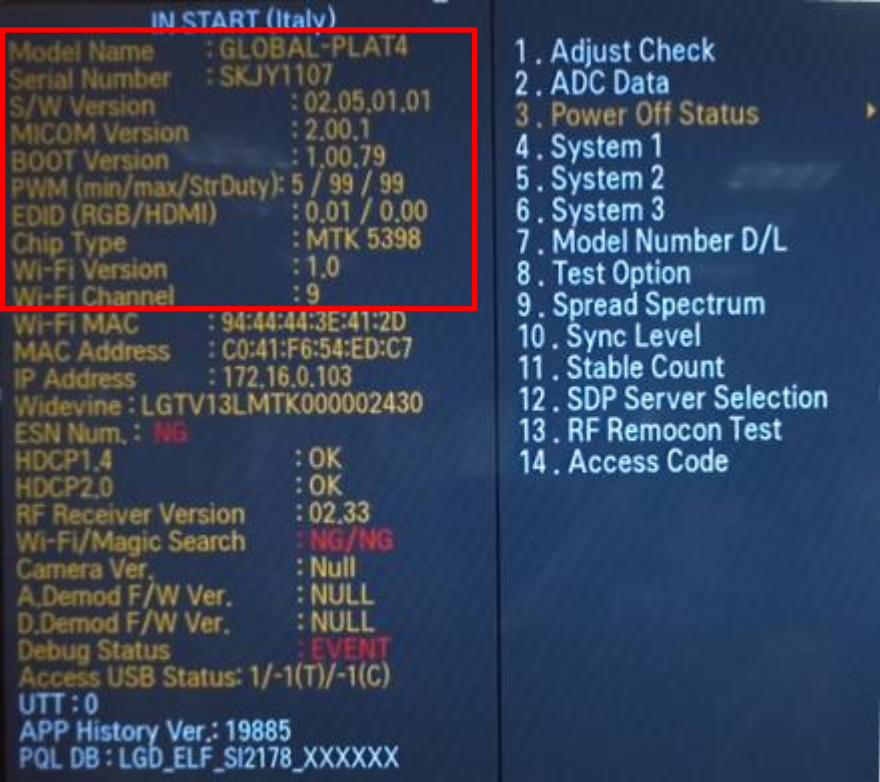
# Standard Repair Process Detail Technical Manual

|        |               |                                            |                  |              |    |
|--------|---------------|--------------------------------------------|------------------|--------------|----|
| LCD TV | Error symptom | A. Video error_Video error, video lag/stop | Established date | 2012. 12 .06 | A7 |
|        | Content       | LCD-TV Version checking method             | Revised date     |              |    |

<ALL MODELS>

## 1. Checking method for remote controller for adjustment

Version



Press the IN-START with the remote controller for adjustment

# Standard Repair Process Detail Technical Manual

|        |               |                                                                     |                  |              |    |
|--------|---------------|---------------------------------------------------------------------|------------------|--------------|----|
| LCD TV | Error symptom | A. Video error _Vertical/Horizontal bar, residual image, light spot | Established date | 2012. 12 .06 |    |
|        | Content       | LCD TV connection diagram (1)                                       | Revised date     |              | A8 |

<ALL MODELS>



As the part connecting to the external input, check the screen condition by signal

# Standard Repair Process Detail Technical Manual

|        |               |                                            |                  |              |    |
|--------|---------------|--------------------------------------------|------------------|--------------|----|
| LCD TV | Error symptom | A. Video error_Video error, video lag/stop | Established date | 2012. 12 .06 |    |
|        | Content       | TUNER checking part                        | Revised date     |              | A9 |

<ALL MODELS>



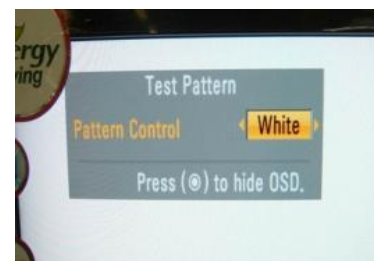
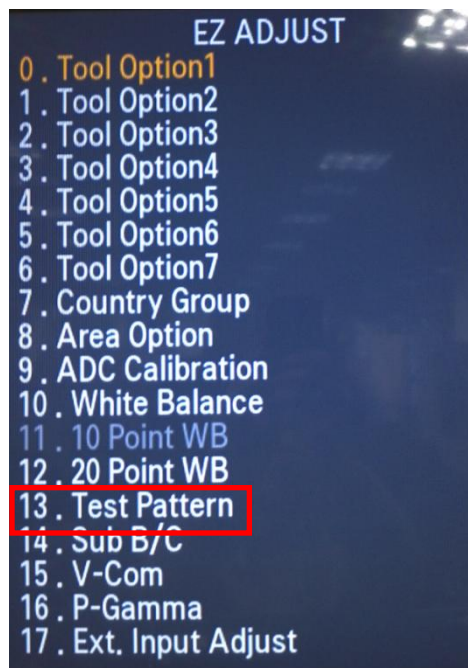
Checking method:

- 1. Check the signal strength or check whether the screen is normal when the external device is connected.
- 2. After measuring each voltage from power supply, finally replace the MAIN BOARD.



# Standard Repair Process Detail Technical Manual

|        |               |                                   |                  |              |     |
|--------|---------------|-----------------------------------|------------------|--------------|-----|
| LCD TV | Error symptom | A. Video error_Color error        | Established date | 2012. 12 .06 |     |
|        | Content       | Adjustment Test pattern - ADJ Key | Revised date     |              | A12 |



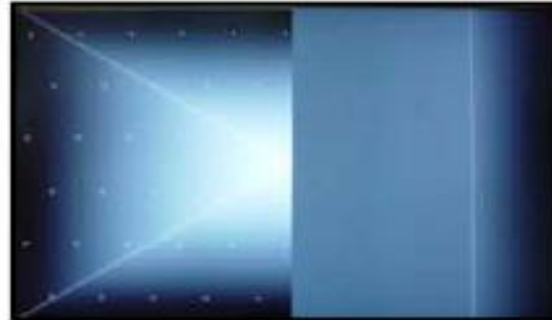
You can view 6 types of patterns using the ADJ Key

Checking item : 1. Defective pixel    2. Residual image    3. MODULE error (ADD-BAR,SCAN BAR..)  
4.Video error (Classification of MODULE or Main-B/D!)

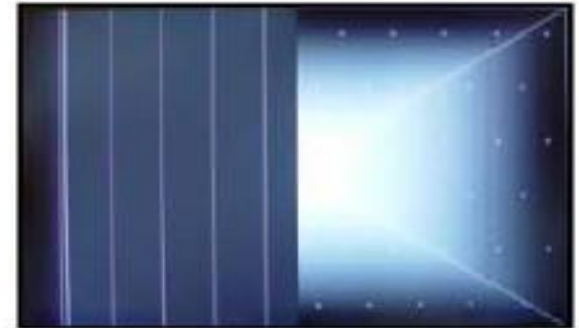
## Appendix : Exchange EPI Cable or Main B/D (1)



Solder defect, CNT Broken



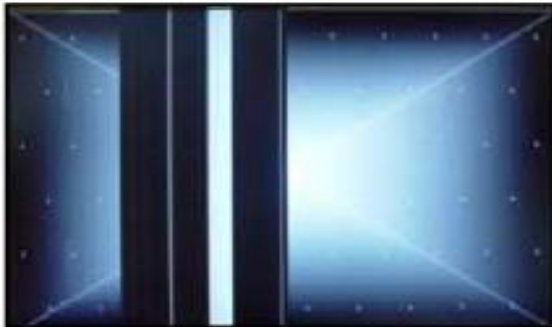
Solder defect, CNT Broken



Solder defect, CNT Broken



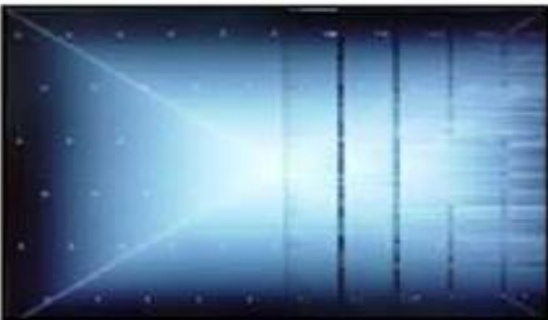
Solder defect, CNT Broken



Solder defect, CNT Broken



Abnormal Power Section



Solder defect, Short/Crack



Abnormal Power Section



Solder defect, Short/Crack

## Appendix : Exchange EPI Cable or Main B/D (2)



Abnormal Power Section



Abnormal Power Section



Solder defect, Short/Crack



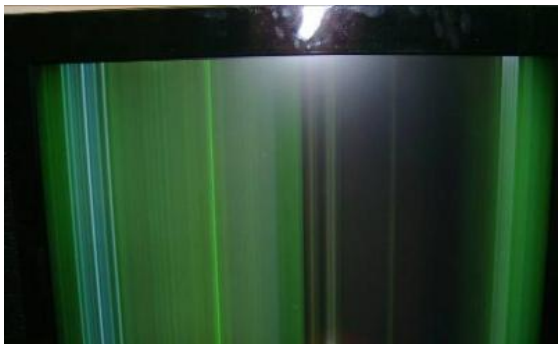
Solder defect, Short/Crack



Fuse Open, Abnormal power section



Abnormal Display



GRADATION



Noise



GRADATION



Appendix : Exchange LPB(LED driver)



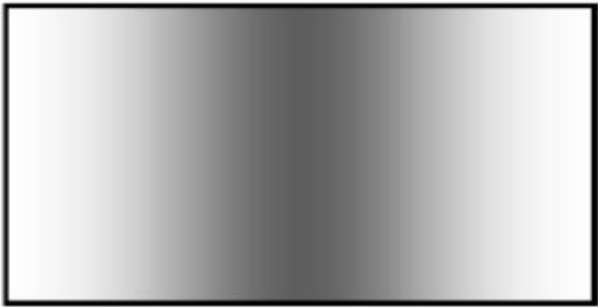
No Light



Dim Light



Dim Light



Dim Light

## Appendix : Exchange the Module (1)



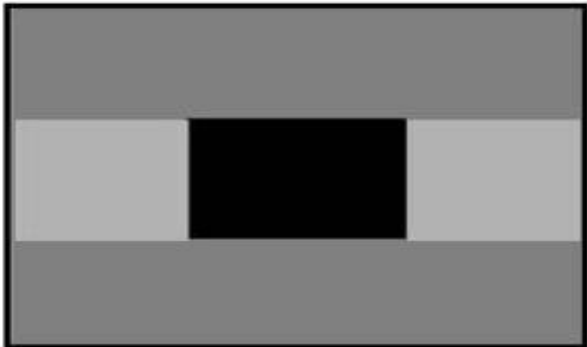
Panel Mura, Light leakage



Panel Mura, Light leakage



Press damage



Crosstalk



Press damage



Crosstalk

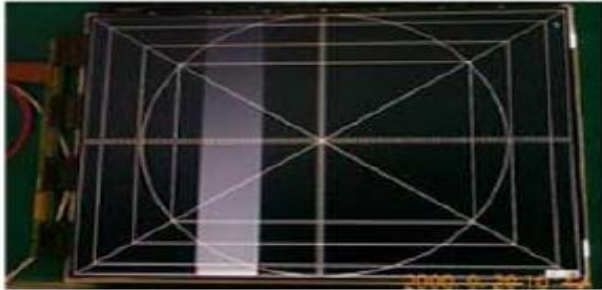


Press damage

### Un-repairable Cases

In this case please exchange the module.

## Appendix : Exchange the Module (2)



Vertical Block  
Source TAB IC Defect



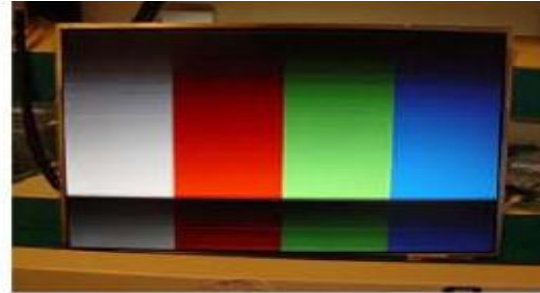
Vertical Line  
Source TAB IC Defect



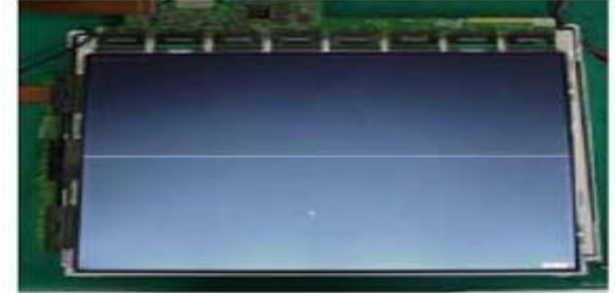
Vertical Block  
Source TAB IC Defect



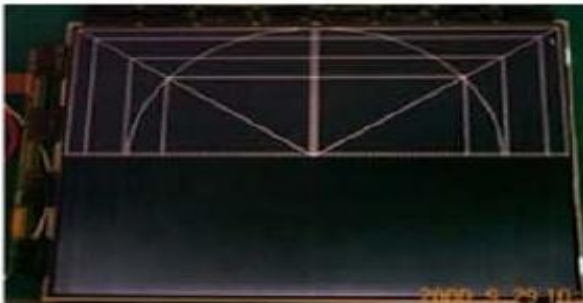
Horizontal Block  
Gate TAB IC Defect



Horizontal Block  
Gate TAB IC Defect



Horizontal line  
Gate TAB IC Defect



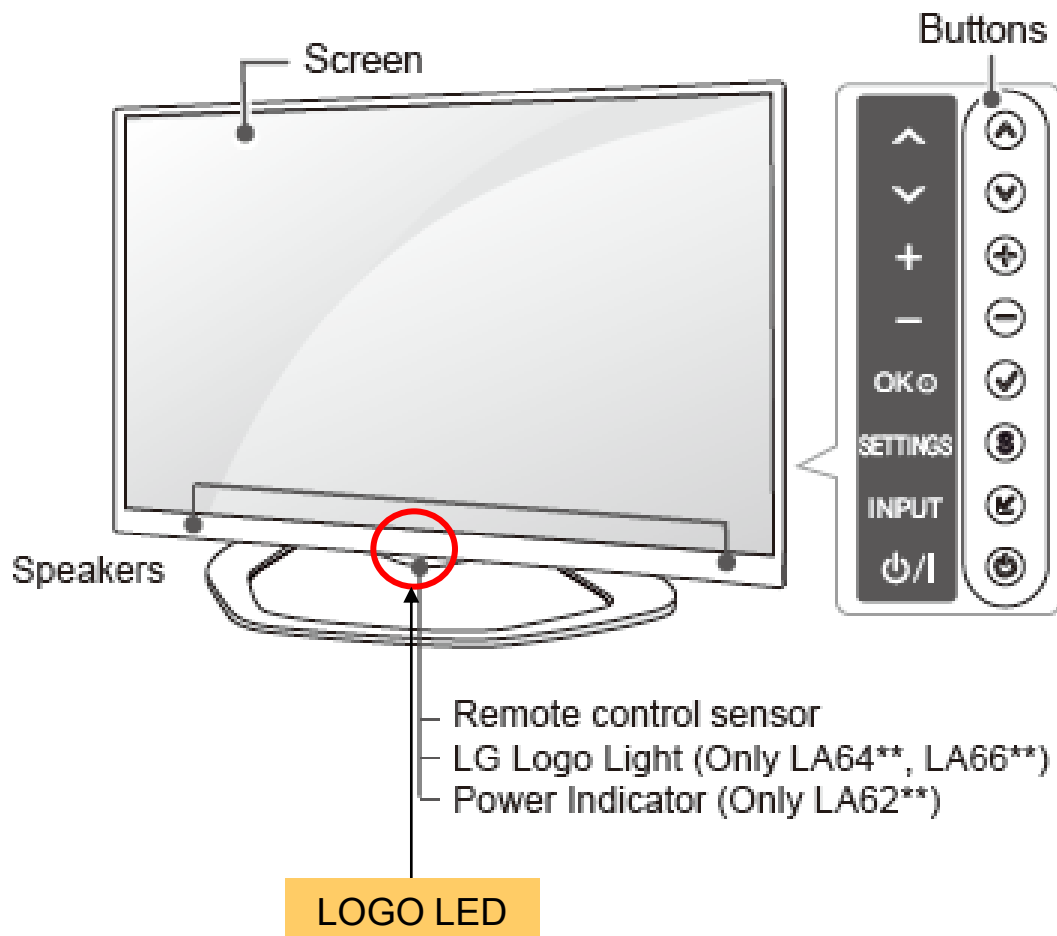
Horizontal Block  
Gate TAB IC Defect

### Un-repairable Cases

In this case please exchange the module.

# Standard Repair Process Detail Technical Manual

|        |               |                          |                  |              |     |
|--------|---------------|--------------------------|------------------|--------------|-----|
| LCD TV | Error symptom | B. Power error _No power | Established date | 2012. 12 .06 |     |
|        | Content       | Check front display LED  | Revised date     |              | A17 |



You can set the LG Logo Light to on or off by selecting OPTION in the main menus.

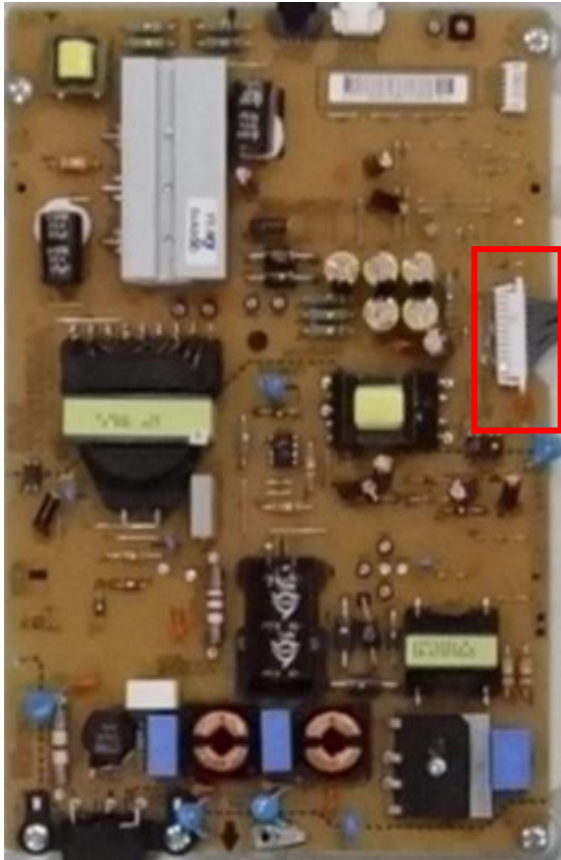
Front LOGO LED control in the status of ST-BY Condition:  
Menu → Option → LG Logo Light  
→ Brightness(OFF,LOW,MIDDLE,HIGH)

Front LOGO LED control in the status of Power On Condition:  
Menu → Option → LG Logo Light  
→ Duration(off, off after10min)

Standard Repair Process Detail Technical Manual

|        |               |                                          |                  |              |     |
|--------|---------------|------------------------------------------|------------------|--------------|-----|
| LCD TV | Error symptom | B. Power error _No power                 | Established date | 2012. 12 .06 |     |
|        | Content       | Check power input voltage and ST-BY 3.5V | Revised date     |              | A18 |

For '10 models, there is no voltage out for st-by purpose.  
When st-by, only 3.5V is normally on.



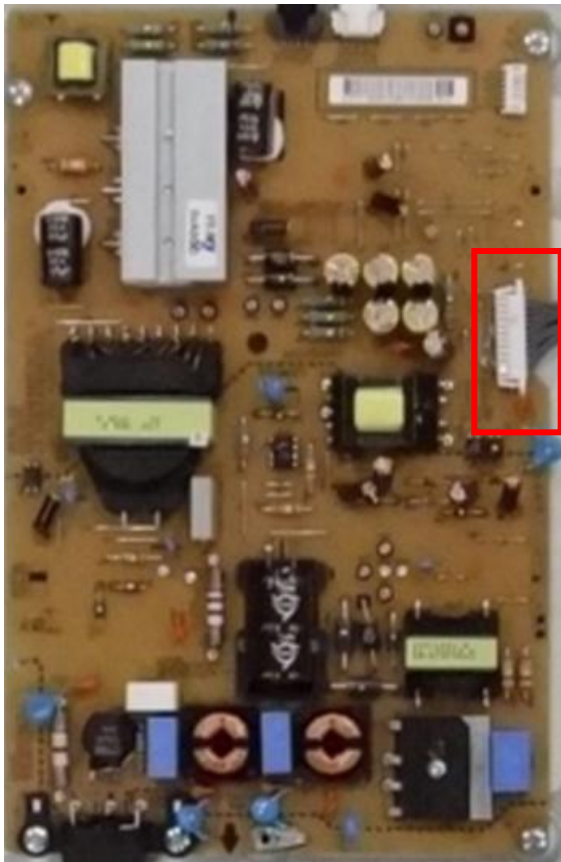
Check the DC 24V, 12V, 3.5V.

| 24 Pin (Power Board ↔ Main Board) |             |    |                 |
|-----------------------------------|-------------|----|-----------------|
| SMAW200-H24S                      |             |    |                 |
| 1                                 | Power on    | 2  | Inverter On/off |
| 3                                 | 3.5V        | 4  | PWM Dim #1      |
| 5                                 | 3.5V        | 6  | PWM Dim #2      |
| 7                                 | GND         | 8  | GND             |
| 9                                 | 24V         | 10 | 24V             |
| 11                                | GND         | 12 | GND             |
| 13                                | 12V         | 14 | 12V             |
| 15                                | 12V         | 16 | 24V             |
| 17                                | GND         | 18 | GND             |
| 19                                | GND         | 20 | GND             |
| 21                                | GND         | 22 | L/DIMO_VS       |
| 23                                | L/DIM0_MOSI | 24 | L/DIM0_SCLK     |

Standard Repair Process Detail Technical Manual

|        |               |                                  |                  |              |     |
|--------|---------------|----------------------------------|------------------|--------------|-----|
| LCD TV | Error symptom | B. Power error _No power         | Established date | 2012. 12 .06 |     |
|        | Content       | Checking method when power is ON | Revised date     |              | A19 |

Check “power on” pin is high



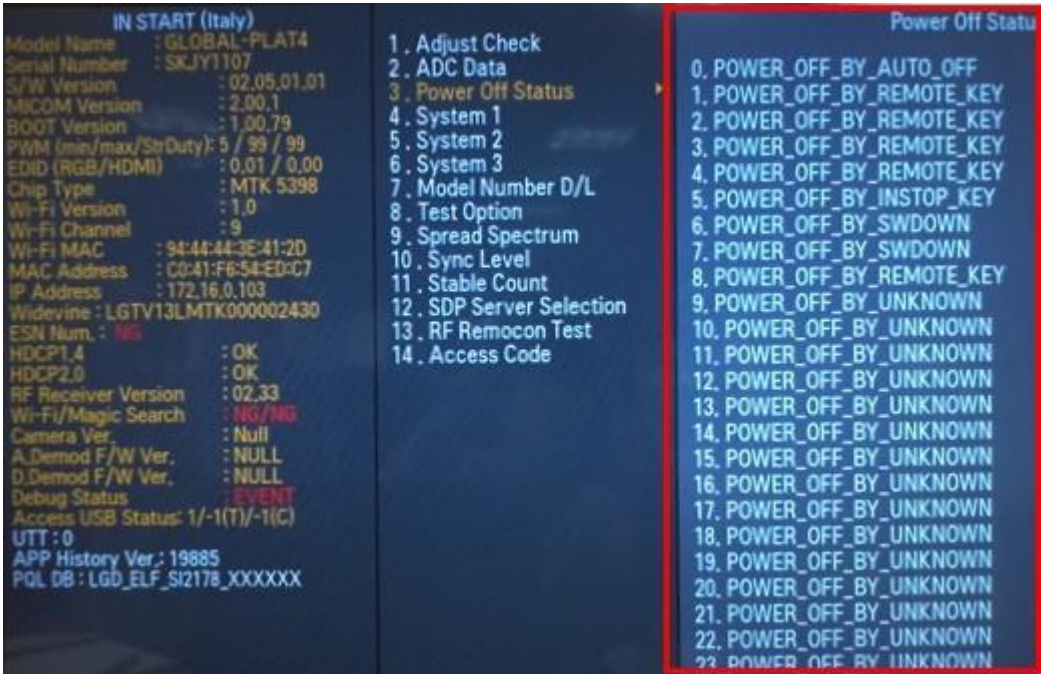
| 24 Pin (Power Board ↔ Main Board) |             |    |                 |
|-----------------------------------|-------------|----|-----------------|
| SMAW200-H24S                      |             |    |                 |
| 1                                 | Power on    | 2  | Inverter On/off |
| 3                                 | 3.5V        | 4  | PWM Dim #1      |
| 5                                 | 3.5V        | 6  | PWM Dim #2      |
| 7                                 | GND         | 8  | GND             |
| 9                                 | 24V         | 10 | 24V             |
| 11                                | GND         | 12 | GND             |
| 13                                | 12V         | 14 | 12V             |
| 15                                | 12V         | 16 | 24V             |
| 17                                | GND         | 18 | GND             |
| 19                                | GND         | 20 | GND             |
| 21                                | GND         | 22 | L/DIMO_VS       |
| 23                                | L/DIM0_MOSI | 24 | L/DIM0_SCLK     |



# Standard Repair Process Detail Technical Manual

|        |               |                                                  |                  |              |     |
|--------|---------------|--------------------------------------------------|------------------|--------------|-----|
| LCD TV | Error symptom | B. Power error _Off when on, off whiling viewing | Established date | 2012. 12 .06 | A22 |
|        | Content       | POWER OFF MODE checking method                   | Revised date     |              |     |

<ALL MODELS>



### Entry method

- 1. Press the IN-START button of the remote controller for adjustment
- 2. Check the entry into adjustment item 3

## Standard Repair Process Detail Technical Manual

|        |               |                                                |                  |              |     |
|--------|---------------|------------------------------------------------|------------------|--------------|-----|
| LCD TV | Error symptom | C. Audio error_No audio/Normal video           | Established date | 2012. 12 .06 |     |
|        | Content       | Checking method in menu when there is no audio | Revised date     |              | A24 |

<ALL MODELS>



### Checking method

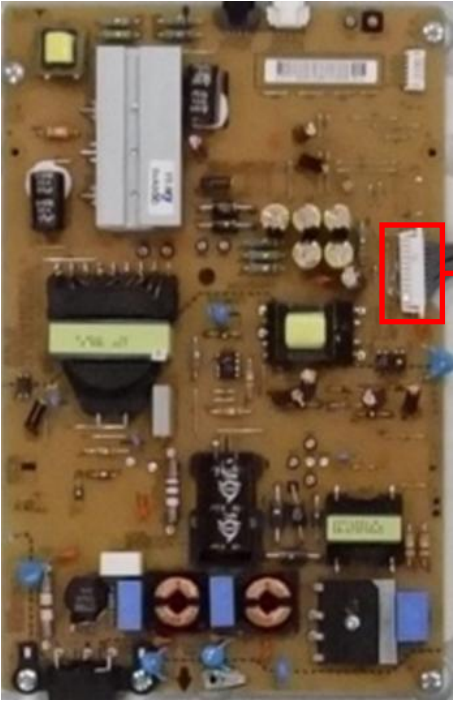
1. Press the MENU button on the remote controller
2. Select the SOUND function of the Menu
3. Change TV Sound Out to TV Speaker



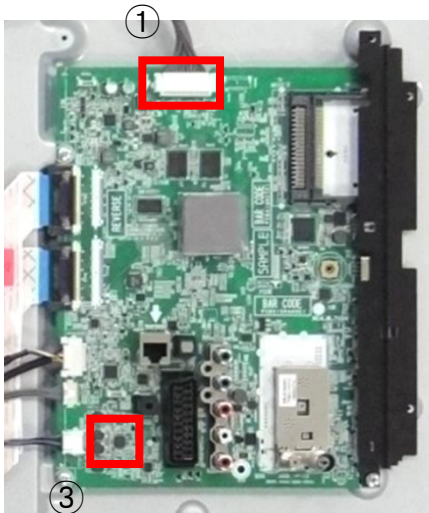
# Standard Repair Process Detail Technical Manual

|        |               |                                                            |                  |              |     |
|--------|---------------|------------------------------------------------------------|------------------|--------------|-----|
| LCD TV | Error symptom | C. Audio error_No audio/Normal video                       | Established date | 2012. 12 .06 |     |
|        | Content       | Voltage and speaker checking method when there is no audio | Revised date     |              | A25 |

<ALL MODELS>



| 24 Pin (Power Board ↔ Main Board) |             |    |                 |
|-----------------------------------|-------------|----|-----------------|
| SMAW200-H24S                      |             |    |                 |
| 1                                 | Power on    | 2  | Inverter On/off |
| 3                                 | 3.5V        | 4  | PWM Dim #1      |
| 5                                 | 3.5V        | 6  | PWM Dim #2      |
| 7                                 | GND         | 8  | GND             |
| 9                                 | 24V         | 10 | 24V             |
| 11                                | GND         | 12 | GND             |
| 13                                | 12V         | 14 | 12V             |
| 15                                | 12V         | 16 | 24V             |
| 17                                | GND         | 18 | GND             |
| 19                                | GND         | 20 | GND             |
| 21                                | GND         | 22 | L/DIMO_VS       |
| 23                                | L/DIMO_MOSI | 24 | L/DIMO_SCLK     |



## Checking order when there is no audio

- ① Check the contact condition of or 24V connector of Main Board
- ② Measure the 24V input voltage supplied from Power Board  
(If there is no input voltage, remove and check the connector)
- ③ Connect the tester RX1 to the speaker terminal and if you hear the Chik Chik sound when you touch the GND and output terminal, the speaker is normal.

# Standard Repair Process Detail Technical Manual

LCD TV

Error  
symptom

D. Function error\_ No response in remote controller,  
key error

Established  
date

2012. 12 .06

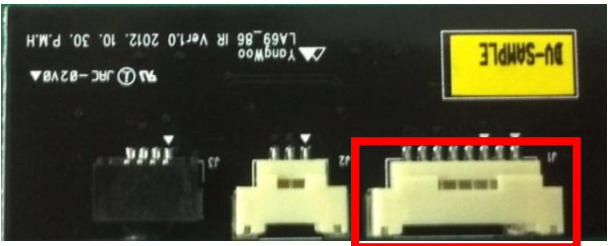
Content

Remote controller operation checking method

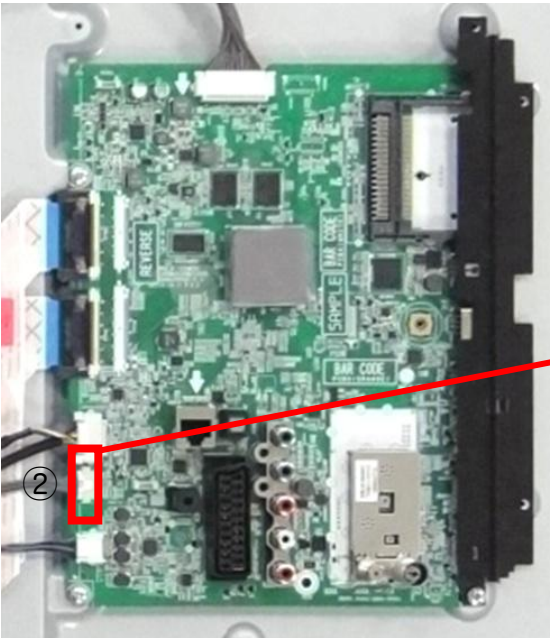
Revised  
date

A27

<ALL MODELS>



①



②

③

④

| P4101 |            |
|-------|------------|
| 1     | GND        |
| 2     | KEY1       |
| 3     | KEY2       |
| 4     | +3.5V_ST   |
| 5     | GND        |
| 6     | LOGO/LED_R |
| 7     | IR         |
| 8     | GND        |

## Checking order

- 1, 2. Check IR cable condition between IR & Main board.
3. Check the st-by 3.5V on the terminal 4.
4. When checking the Pre-Amp when the power is in ON condition, it is normal when the Analog Tester needle moves slowly, and defective when it does not move at all.

# Standard Repair Process Detail Technical Manual

|        |               |                                 |                  |              |     |
|--------|---------------|---------------------------------|------------------|--------------|-----|
| LCD TV | Error symptom | D. VCOM Adjustment              | Established date | 2012. 12 .06 |     |
|        | Content       | Sequence of the Vcom adjustment | Revised date     |              | A28 |

## 1. Case

- LCD module change
- T-Con board change

## 2. Equipment

- Service Remote controller

## 3. Adjust sequence

- Press the 'adj' key
- select V-COM
- As pushing the right or the left button on the remote controller, And find the V-COM value Which is no or minimized the Flicker.  
**(If there is no flicker at default value, Press the exit key and finish the VCOM adjustment.)**
- Push the OK key to store the value. Then the message "Saving OK" is pop.
- Press the exit key to finish V-COM adjustment.

